AMERICAN DYESTUFF REPORTER

SAMPLE SWATCH QUARTERLY

"Circulated Everywhere Dyestuffs Are Used"

Published by Howes Publishing Company, 90 William Street, New York

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

NEW YORK, JULY 9, 1928

The Scouring and Bleaching of Cotton Fabrics*

Starches—The Fat and Wax—The Pectins—The Proteins—The Pigments of Cotton—The Mineral Matter

By PROF. M. FREIBERGER

(Technische Hochschule, Berlin-Charlottenburg)

FOR many decades the scientific aspects of scouring and bleaching were neglected; interest was lacking, and there was no fostering of research by interested parties as in the applications of dyestuffs. The modern rapid developments in the chemistry of cellulose, fats and enzymes, and in related sciences, have, however, provided valuable explanations and many stimuli to research which have been applied to the practical problems. It is the purpose of this paper to review recent discoveries in the chemistry of the removal of the non-cellulosic constituents of cotton, and to discuss some of the technical questions related thereto.

The most important of the substances which have to be removed from cotton cellulose are starches, fats, and similar compounds, pectins, proteins, pigments, and mineral matter. The bleacher's task, in any event, is to remove these impurities as uniformly as possibly, especially when the process is not carried to the length of setting free practically pure cellulose. An irregularly scoured or bleached fabric may be regarded as one with invisible patches and faults, derived from various qualitatively and quantitatively uneven residues of impurities and degradation products of cellulose. These residues hinder to a greater or lesser extent wetting-out and the penetration of bleach liquors, mordants, dyes and finishing materials, and thus cause faults like uneven dyeing and uneven whites, detectable by the eye of the expert in cloth bleached for white or certain printed goods.

Starches

It is comparatively recently that emphasis has been laid on the importance of the complete removal of starch before kier boiling. In an experiment, I treated a gray cloth with diastafor for several periods from 0 to 120 minutes, thus removing the starch to different extents up to completion, as indicated by the production of a silver-gray color in the iodine test. The cloths were then scoured with 2.5 per cent caustic soda at two atmospheres pressure for six hours. The gray cloth which had not been desized contained 22 per cent more fat and material soluble in cold 5 per cent caustic soda than the best. It appears probable that the colloidal starch forms on the cellulose a complex compound with the other colloids present, such as soaps, pentosans, etc., which is resistant to removal by the kier liquor. In this connection it may be recalled that mordant dyes are faster on a mixture of mordants than on a single one.

In the rot steep, in which the cloth is soaked in water or spent lye, and then piled, there is a risk of attacking the cellulose, through excessive hydrogen ion concentration and temperature, through the action of bacteria which cause damp stains, and through the action of the enzyme cellulase which can bring about the degradation of cellulose. In practice, the critical point is not readily determined with certainty.

The hydrolysis of starch to maltose by means of diastatic amylase of vegetable or animal origin, offers a greater margin of safety, but the costs are not negligible. Pure amylase does not attack cellulose. If the cloth is not sufficiently treated, residues remain in consequence of a resynthesis of insoluble substance, or because the two components of starch, namely, amylose and the phosphoric ester amylopectin, are hydrolyzed to different extents. The course of the hydrolysis is sensitive to temperature, hydrogen ion concentration and so forth. In addition, the other enzymes besides amylase contained in technical preparations, attack the fat, wax, pectins and peptones, and break down to a greater or less extent. Thus there are always irregularities in the cloth

*Translation of a paper presented at the British Textile Institute Conference held in Cologne, Germany.

pile, even when the action of the amylase is carried to the extreme.

If the dissolution of the starch is carried out by acids until the iodine test fails, the cellulose might also be broken down, partly to glucose and partly to cellobiose, a sugar which stands in about the same relationship to cellulose that maltose does to starch. Acid steeping can, however, be applied in combination with other means for desizing, within certain limits, without attack on the cellulose, if a systematic and well-controlled, uniform and mild action in continuous rope form is devised.

A pretreatment with "Activin" leads to the formation of soluble starch, which as a colloid adheres fairly strongly to the cellulose, and can be removed by hot water, for example, by washing the cloth in rope form.

A summary of the *modus operandi* of the desizing processes confirms practical experience that it is advisable to combine two different methods: for example, a caustic boil followed by a sour, or else an enzyme steep followed by acid or alkaline treatment. Furthermore, it is advisable to make the desizing operation as uniform as possible, preferably by a continuous process.

The Fat and Wax

The fats and fatty substances present in cotton have been found to include, besides glycerides, the esters of higher alcohols, waxes, free fatty acids, alcohols, and solid and liquid hydrocarbons. The fats in fabrics originate partly from the size and partly from the cotton-seed oil, which, as a semi-drying oil, thickens, and in damp storage becomes rancid. The fatty acids which are liberated as the oil becomes rancid are partly dissolved merely by soaking the singed cloth in hot dilute caustic soda, which distinctly improves the wetting qualities of goods containing much seed husk. The saponification of the triglycerides in the kier is comparatively simple; in many cases I have been able to show that even a treatment with soda ash at about 98° C. had removed about 36%. The cloth behaves towards the colloidal process liquor (e. g., the kier liquor) as a filter, especially when cooling of the kier contents with wash water is too rapid. The soaps of the alkaline earths present in hard water have a relatively high melting point, which is higher still if iron and manganese are present. A desized calico which contained 0.58% of fat extractable by alcohol and ether had 0.22% after a boil for printing, 0.19% after two caustic boils in a Thies kier, 0.125% after a modern improvement of the last process, and 0.08% after a three-process scour.

The most resistant fatty substances in a cloth are the waxes and wax alcohols, and apparently the hydrocarbons. These are emulsified by the soaps formed in or deliberately added to the kier liquor, and I have found that an alkaline solution of wood gum, which possesses the same colloidal properties, has the same effect.

The importance of a thorough elimination of fat is obvious from the following observations. A well-scoured and bleached printer's cloth was impregnated first with an alcohol-ether extract from a bleached cloth and later with solutions varying in concentration of Japan wax, which is similar to crude cotton wax in its characteristic constants. The untreated cloth wetted out in water in 1½ seconds; after padding with a 0.05% solution in five seconds; with a 0.1% solution in 25 seconds; and with 0.2% of wax in one minute. Quite small differences strongly modify the water-resisting quality of the cloth. The amount of the alcohol-ether extract provides valuable information on which to judge of the regularity to be expected of a bleached but not scoured cloth in dyeing, printing and finishing, or on which to compare it with other goods.

The Pectins

A number of pectic substances are recognized. They are mixtures of pentosans or their bleached acid esters. Of the pentosans, wood gum or "xylan" is transformable into wood sugar or xylose, but the pectic esters are built up of an aldo-hexose, namely, galactose, and the alkaline earth salts of galacturonic acid. Plants are also said to contain the enzyme pectase which coagulates pectins. The coagulated pectins present in cotton can be rendered soluble and decomposed by an enzyme, pectinase, which is present in fruits and also in germinated malt. In enzyme steeping with technical products prepared from plant amylases some amount of action on pectins must therefore be reckoned with.

A simple prefermentation after soaking in water also appears to remove part of the pectins; I found a loss of roughly 15% on an average from loose cotton. What part the pectins play in cotton, and how they are removed is not immediately apparent. A pretreatment with acid sets more or less of the pectic acid free, but a complete hydrolysis of the pectins cannot be realized at this stage. The major portion is removed during bleaching, but as with fats, the quantity depends on the process. The cotton behaves here also as a filter towards the colloidal solution, and the waste liquors and the properties of the works water supply are important.

Oxidation bleaches change the pectins to substances which are more soluble in alkali, and probably contain hydroxyl or barboxyl groups. For this reason a chemic interposed between two-kier boils is extremely effective. Similarly, pectins can be dissolved by an aftertreatment of the chlorinated goods, and in the so-called cold bleach, with alkaline liquors containing peroxide. Hydrolytic products of the pectins remain on the goods after scouring.

I have been able to extract such material with 5% caustic soda and precipitate it from alkaline or acidified solution by means of alcohol. The productions differ in their resistance to chlorination and in the yellow color they develop on steaming. This agrees with my previous observations relative to the substances present in kier liquor.

The substances soluble in 5% caustic soda hinder the

wetting of the cloth. I have placed bleach cloth in such a solution to which alcohol was added, and then after a light sour and drying found it to be more difficult to wet out than before. In spite of their extremely complex chemical composition, the structure of different pectins is already understood, and therefore there is a prospect that more light will be thrown on these problems than hitherto.

To sum up, the pectins are not altered and dissolved in a single bleaching operation, but bit by bit through several processes. They are present in cotton between the cellulose crystallites. In view of these considerations, the conclusion may be drawn that for a uniform removal of pectins all operations should be rendered as smooth as possible. This can only be achieved by a continuous process.

The Proteins

It appears that no sufficient attention has yet been paid to the proteins, that is the dried up protoplasm present in the lumen of the cotton hair. Some time ago I noticed that an unbleached Indigo-dyed cotton was discharged by nitrosylsulphuric acid not to a white but to a pale yellow, and I therefore paid some attention to the xanthroproteic reaction. I found that after scouring, and even after bleaching, cotton still contains noteworthy amounts of nitrogenous residues, apparently of the tyrosine series. Millon's reagent and also Pauly's test gave colorations to various intensities. I have therefore determined the nitrogen in different materials by Dumas' combustion method, with the following results:

Nitrogen Content of Scoured and Bleached Cloths

1. Twill, medium weight, mercerized.....	0.338%
2. Calico desized	.227
3. No. 1, after good caustic boil for dyeing.	.110
4. Gray cloth, caustic and soda ash boil....	.067
5. Gray cloth, lime, soda, sour treatment...	.061
6. No. 2, calico, caustic boil for printing..	.061
7. No. 6, calico, chemicked, soured.....	.052
8. Gray cloth, drastic chemic for white....	.044
9. Calico, twice scoured, twice chemicked..	Mere trace
10. Calico, scoured, chemicked, treated with superoxide	Mere trace

The results confirm my supposition that the vegetable proteins are not completely hydrolyzed to soluble amino-acids under the conditions of scouring; not inconsiderable residues remain, apparently albumoses and peptones. Bleaching reduces the nitrogen content by roughly 20%, but since the above-mentioned reagents only give faint color reactions, it follows that the chemical constitution of the remainder is profoundly modified by the oxidizing action. It may be assumed that the remaining protein degradation products have an influence on the white, and the permanence of the white, of the bleached goods. In order to secure even distribution of the impurities in the cloth during the different processes it is therefore necessary to apply the same consideration to the proteins as before, namely, the goods must be given as uniform a treatment as possible.

The Pigments of Cotton

The colored substances appear to be partly laid down in the fiber through intussusception, like the pectins, and partly derived from the ruby-red or dark colored oil from the seed capsules of the cotton. ,In addition, colored degradation products formed in the intermediate operations have to be considered. Many of these substances, in spite of their relatively considerable amount, are only recognizable by their pale yellowish-brown color. Here again one observes by the color after the main operations —desizing, scouring and bleaching—that a uniform treatment must be favorable to an even distribution and a satisfactory final effect. The residues of pectins, proteins and colored substances left in chemicked cotton can be removed by a second boil and chemic, or, more simply, as practical experience teaches, by a treatment with alkaline peroxide, thus giving a pure white. Treatment with peroxide can be carried out technically in different ways; for example, by Mohr's process or the process of the Deutsche Goldund Silberscheideanstalt, or simply and evenly, as I would recommend by running the chemicked cloth in rope form through a hot-alkaline liquor which is maintained colorless by the addition of peroxide.

The Mineral Matter

The inorganic compounds play the part of mordants towards many dyestuffs. They are partly derived from the water supply, and may adhere in spots to the cloth in the form of agglomerations. To remove them an acid treatment is necessary. If the cloth has been treated with a silicate, the silicic acid thus set free will remain in the goods. Whereas desizing, scouring, chemicking and treatment with peroxide can be safely carried out as continuous operations, scouring cannot be so performed. Irregularities are not avoided in the ordinary kiers. According to my investigations, the quantity of ether extract obtained from a cloth scoured in different types of kiers and at different points in a kier varied by as much as 18%.

Enough has been said to indicate that this branch of the industry is incompletely developed on the technical side, and that we are still a long way from a sufficient scientific understanding of the problems.

Josiah Wedgwood, a celebrated potter of Staffordshire, England, introduced the first practical instrument for measuring high temperatures in 1782. This was based on the progressive contraction of clay baked at increasing temperature. It was without a rival for forty years and is still in limited use.

Solubilizing of Starch With Aktivin

By Dr. Richard Feibelmann

AKTIVIN has been used in Germany and other countries during the last four years for many purposes in the textile industry. But in the United States it has remained almost unknown. As Aktivin is now produced in this country* and can be bought at a reasonable price, some information on its use in making soluble starch will no doubt be interesting to prospective users.

At first some short general statements about the substance may be given. Aktivin is a white, soluble powder, with a faint chlorine-like odor. It is not a mixture, but a uniform organic compound of the formula $CH_3.C_6H_4SO_2.N<\begin{matrix}Cl\\Na\end{matrix}.3H_2O$, the Cl atom of which is available. The solution of Aktivin in water is practically neutral. The outstanding difference between Aktivin and the commonly known inorganic hypochlorites consists in its stability. For instance, a pure solution of 1% Aktivin can be boiled for two hours without decomposing more than about 10% of its contents. In the presence of oxidizable substances the reaction is self-evidently quicker.

The solubilizing of starch consists in the diminution of the starch particles. When starch is boiled with water, the starch granules swell and form a paste, which with a sufficient amount of water, can be very thinly liquid. But nevertheless, this is not a solution. The swollen granules form large aggregations of molecules, the weight of which is estimated to be about 120,000 in relation to the weight of one atom hydrogen = 1. Such large aggregations are not able to penetrate the pores of the fiber, they stay on the surface, even as they cannot be filtered through paper. If a size is used, prepared by boiling starch with water, the starch forms a "tube" surrounding the fiber, which partly falls off as a dust in the looms, and while it makes the fiber stiff and hard, does not give it the necessary strength. Therefore, softeners, like tallow, and soluble substances such as British gum are usually added to such sizes for strengthening the body of the fiber. But the chief part of the size cannot penetrate the body of the material.

Aktivin reduces the starch aggregations when boiled with the paste, without, however, converting the starch into dextrine and sugar, as is the case when enzymes are used. The starch particles obtained by the use of Aktivin are so small that they can easily penetrate the fiber, making unnecessary the addition of specially prepared soluble substances. Aktivin starch solution contains the starch chemically unchanged as is shown by the pure blue coloration with iodine. In consequence of the smallness of the starch particles the thread is also more elastic, even without the addition of tallow.

*Manufactured by the Aktivin Corp., New York City.

Professor Dr. Krais of the German Research Instisute for the Textile Industry in Dresden, has studied this question, and I give here some typical figures of his work, relating to the sizing of cotton.†

Amount of the Absorbed Size:	
Without Aktivin	8.05%
With Aktivin	11.98%
Increase of the Strength:	
Without Aktivin	13.80%
With Aktivin	28.50%
Loss of Elasticity:	
Without Aktivin	30.00%
With Aktivin	23.00%

The figures demonstrate that the fiber absorbs much more size when Aktivin is used, and that the strength is much greater. Nevertheless, the loss of the natural elasticity is much less than when common boiled size is used. The Aktivin starch size is, therefore, to be preferred.

A special brand of Aktivin is manufactured for sizing, the so-called Aktivin-S, which is the result of several years' experience and is the basis of the following directions:

One hundred pounds of starch (cornstarch, for instance) are well mixed with 100-200 gallons of water, then 1% (of the weight of the starch), i. e., 1 pound of Aktivin-S is added and direct steam is applied. At first, a paste is formed, then the temperature should be raised almost to boiling point, and kept at that temperature for 15 to 20 minutes, always stirring with a mechanical mixer. The paste becomes thinner and more liquid after a while, the feel is oil-like, and the solution runs from a stick as a light, transparent viscous liquid. If a drop of this liquid is dried between the thumb and forefinger and the fingers then pressed together, a very strong adhesion is observed, much stronger than that of an ordinary paste.

The question as to the amount of water to be added cannot be answered generally. This will depend on the kind and number of the yarn, on the layout, and other circumstances. More about this will be found in a booklet on "Aktivin as a Solubilizing Agent for Starch in Sizing and Finishing," issued by the manufacturers. Further additions to the size are generally not necessary. Only when very thin cotton yarn is to be sized, a little tallow may be added, or in sizing thin woolen warps some animal glue.

Cornstarch vs. Potato

In the American Dyestuff Reporter for December, 1927, Robert P. Walter says that considerably larger amounts than 1% Aktivin would be necessary for solubilizing cornstarch, this starch being more resistant to

†Published in the Forschungshaft 7 (1927) of the above mentioned institute. Price $1.00.

The Action of the Alkalies Upon Wool

Part IV

A Review and Discussion of the Literature Upon the Action of the Various Alkalies Upon the Wool Fiber —The Hydrolysis of Hair—The Influence of pH Upon the Color and Strength of Yarn— Ammonia on Wool—Wool "Xanthate" and Keratin Rayon

By CHAS. E. MULLIN, M.Sc., F.A.I.C., F.T.I.

Professor of Textile Chemistry and Dyeing at Clemson College

(All rights reserved by author.)

A VERY interesting quantitative investigation of the hydrolysis of treated calfskin and chloroform extracted hair by solutions of both hydrochloric acid and sodium hydroxide (from 4*N* acid to 4*N* base), under varying conditions of hydrogen ion concentration, temperature and time, was made by H. B. Merrill, *Ind. Eng. Chem. 16*, 1144-1166 (1924), in connection with his study of depilatory processes. His results are given below in Tables LXX, LXXI and LXXII. In all of these tables the degree or extent of the hydrolysis in each experiment was measured by determining the percentage of the total nitrogen present which had passed into solution. The curves accompanying the original paper bring out the various points much better than the tables given.

Table LXX shows the effects of varying the hydrogen ion concentration factor only, the concentration varying from 4*N* sodium hydroxide to 4*N* hydrochloric acid, the time (twenty-four hours) and temperature (25° C. or 77° F.) remaining constant in every case. The pH values given are those of the solutions at the end of each experiment, not at the beginning, from which they may differ somewhat, depending upon the quantity of buffer present. At the neutral point, or even at from pH —0.2 to 13.5, there is comparatively little hydrolysis in twenty-four hours at 25° C., but as the pH is further increased or decreased beyond these points there is a very abrupt increase in the degree of hydrolysis. In other words, when the acidity or alkalinity of the solution reaches a certain point, complete hydrolysis occurs (under the conditions specified), and before these points are reached very little or practically no hydrolysis takes place with these particular materials. In an acid solution the skin, which is high in collagen, is more easily hydrolyzed than hair, at the same hydrogen ion concentration, while in alkaline solution the reverse is the case and the hair is more readily hydrolyzed than the skin.

Table LXXI shows the effect of temperature as the variable factor. As the temperature of the solution rises, the pH value at which complete hydrolysis occurs drops. This effect is more marked in the case of the skin than with hair. Skin is not completely hydrolyzed by 4*N* sodium hydroxide solution at 7 and 15° C.

Table LXXII shows the effects of time as the variable, the hydrogen ion concentration and temperature remaining constant. The effect of increasing the time of action is similar to that of raising the temperature. That is, there is a comparatively small increase in the amount of hydrolysis over the intermediate hydrogen ion concentration range where little hydrolysis occurs, but the pH value at which marked hydrolysis begins is shifted toward the region of lower acidity or alkalinity as the period of action is increased.

TABLE LXX

Effect of the Hydrogen Ion Concentration Value Upon the Hydrolysis of Skin and Hair in Solutions of Hydrochloric Acid and Sodium Hydroxide at 25° C. (77° F.) for Twenty-four Hours.

pH Value of Used Solution	Per Cent Hydrolyzed Skin	Hair
— 0.7	50.90	2.91
— 0.2	5.04	1.74
— 0.1	2.83	1.74
0.5	1.50	1.17
0.7	1.33	1.35
1.0	1.90	1.55
1.3	2.66	1.26
2.2	2.08	1.17
2.6	1.70	0.97
3.8	1.04	0.68
6.4	0.10	0.00
7.9	0.00	0.00
10.7	0.10	0.00
12.1	0.60	0.00
12.5	0.80	0.34
12.8	2.10	0.80
13.2	3.10	5.15
13.5	7.10	9.91
14.0	40.90	95.42
14.3	100.00	100.00

It is possible to explain the very sharp and decided change in the action of acids and bases upon the proteins, in this case hair (keratin) and calfskin (collagen), in several ways. The points pH —0.2 and 13.5 may correspond to the acid and alkaline activity necessary to completely break down the weakest amino acid linkages within the protein molecule, with the formation of soluble pro-

tein decomposition products. Other similar or slightly more resistant linkages may open up in solutions of slightly greater activity, with the eventual complete hydrolysis of the protein. Between the points pH —0.2 and 13.5 the slight solubility of the protein may be due to the formation of protein additive compounds at the peptide or other linkage, with the acid or alkali present.

TABLE LXXI

Effect of Temperature Upon the Hydrolysis of Skin and Hair in Sodium Hydroxide Solution for Twenty-four Hours.

pH Value of Used Solution	Per Cent Hydrolyzed Skin	Hair
Temp. 7° C. (45° F.)		
11.90	0.95	....
12.90	0.89	1.54
13.20	1.71	0.77
13.50	1.71	5.64
13.70	2.09	19.02
13.85	1.33	41.72
14.10	2.57	89.08
14.40	3.80	95.45
Temp. 15° C. (59° F.)		
12.10	....	1.60
12.40	....	0.68
12.60	0.95	1.83
12.70	1.43	1.47
12.85	2.85	1.35
13.20	1.04	2.32
13.50	3.04	11.50
13.60	4.47	30.34
13.80	5.13	67.83
14.10	8.52	94.69
Temp. 25° C. (77° F.)		
12.20	0.60	0.00
12.50	0.80	0.34
12.80	2.10	0.80
13.20	3.10	3.15
13.50	7.10	9.91
14.00	40.90	95.42
14.30	100.00	100.00

It is also possible to explain the action on the basis of "peptization"; that is, the true peptization as defined by Graham, *Proc. Roy. Soc.*, June 16, 1864, which is very ably discussed by A. V. Slater in *Chemistry and Industry 44*, 499-506 T (1925). Within certain pH limits, in the above case between —0.2 and 13.5 pH, the hydrolysis or solution of the protein in the solvent (water) may be due entirely to the peptizing action of the acid or alkali, as the case may be. At values beyond these limits the action very probably is strictly a chemical union between the protein and the reagent, which results in a true solution of the protein in the aqueous solvent. Slater, *loc. cit.*, explains the action of sodium hydroxide upon alumina in this manner.

Chapin's Work

Undoubtedly all readers of the American Dyestuff Reporter are familiar with Dr. H. C. Chapin's excellent article in the issue of December 28, 1925, on the "Effect of Alkalies on Wool: Importance of pH," and therefore it is only necessary to review it briefly and give Table LXXIII, showing the relation of the hydrogen ion concentration to the color and strength of the wool fiber.

All experiments were made at room temperature, 24° C. (75° F.), using two-ply No. 36 worsted yarn, twist 16 by 11, previously solvent extracted. The yarn samples were each treated in its respective solution for forty-eight hours at room temperature. In each case column 3 of Table LXXIII gives the initial pH of the solution before entering the wool, and column 4 the pH after treating the wool. The change in the pH (strength) of the solution is entirely due to the removal of the alkali by combination with the wool or its decomposition products, and to the buffer action of the protein products remaining in the solution. The treated samples were well rinsed for an hour, wrung out and dried. The first horizontal line in the table gives the strength of the skeins treated with pure water only. The color of this skein is given as zero, or the standard. The other numbers given under color in column 5 merely represent the order in which the skeins were graded for color, and are not a measure of the intensity of the color itself. The last two columns of the table indicate the dry and wet strength, respectively, of the treated samples. This table readily shows that as the hydroxyl ion concentration or pH of the final solution increases, the color increases, while the strength decreases.

TABLE LXXIII

Showing the Relation Between the pH of the Scouring Liquor and Strength and Color of the Scoured Yarn

Concentration of Scouring Liquor Mols. per Liter		pH			Strength of Yarn	
NaOH	$Na_2B_4O_7$	Initial	Final	Color	Dry	Wet
0	0			0	254	229
0.04	0	12.3	12.1	12	227	166
0.04	0.0165	11.5	11.1	8	242	194
0.04	0.0185	11.1	10.6	6	251	202
0.04	0.02	10.6	10.2	7	250	217
0.02	0	12.0	11.8	10	242	181
0.02	0.0068	11.6	11.2	11	242	203
0.02	0.0090	10.9	10.3	4	244	208
0.02	0.01	10.4	10.1	2	257	221
0.01	0	11.7	11.4	9	244	204
0.01	0.0020	11.5	10.9	5	235	198
0.01	0.0035	11.1	10.4	3	244	201
0.01	0.0050	10.4	9.9	1	252	218

H. C. Chapin, Amer. Dyestuff Reporter **15,** 859-866 (1925).

Chapin says: "It is apparent, then, that under the conditions studied pH is a better guide for predicting the probable effect of alkali on wool than is concentration of the alkali itself. It is likely that this is true under all conditions, although this needs confirmation by experiment at higher temperatures and with chemicals more commonly used in scouring and dyeing."

TABLE LXXII

Effect of Time Upon the Hydrolysis of Skin and Hair in Solutions of Sodium Hydroxide at 25° C. (77° F.) and 7° C. (45° F.)

pH Value of Used Solution	Per Cent Hydrolyzed Skin	Per Cent Hydrolyzed Hair
Time, one day at 25° C.		
11.20	0.00	0.00
12.20	0.60	0.00
12.50	0.80	0.34
12.80	2.10	0.80
13.20	3.10	5.15
13.50	7.10	9.91
14.00	40.90	95.42
14.30	100.00	100.00
Time, two days at 25° C.		
11.20	1.24	0.70
12.10	1.52	0.70
12.50	1.61	0.57
12.80	3.08	2.09
13.20	4.75	5.98
13.50	9.03	65.17
13.90	81.20	88.31
14.40	99.90	....
Time, three days at 25° C.		
11.20	3.05	2.51
12.00	3.05	1.45
12.40	3.90	1.93
12.60	4.09	2.71
12.80	4.57	3.28
12.90	4.75	2.90
13.10	8.84	....
13.50	7.90	83.29
13.70	98.90	98.55
Time, one day at 7° C.		
11.90	0.95	....
12.90	0.86	1.54
13.20	1.71	0.77
13.50	1.71	5.64
13.70	2.09	19.02
13.85	1.33	41.72
14.10	2.57	89.08
14.40	3.80	95.45
Time, two days at 7° C.		
10.70	....	2.13
12.30	1.58	1.45
13.00	1.43	1.84
13.20	2.39	3.48
13.50	3.33	11.23
13.70	5.05	52.18
13.80	4.85	82.22
14.10	5.30	91.98
14.20	4.75	92.74
14.40	5.90	100.00
Time, five days at 7° C.		
10.70	2.00	1.75
12.30	....	1.45
13.05	2.76	1.83
13.20	4.01	6.09
13.50	5.61	26.57
13.70	7.55	94.49
13.80	7.23	100.00
14.10	....	....
14.20	8.44	....
14.40	9.41	....

Effect of Time Upon the Hydrolysis of Skin and Hair in Solutions of Hydrochloric Acid at 25° C. (77° F.).

Time, one day.		
— 0.7	50.90	2.91
— 0.2	5.04	1.74
+ 0.1	2.83	1.74
0.5	1.33	1.55
1.0	1.90	1.55
1.3	2.66	1.26
2.2	2.08	1.17
2.9	....	1.74
6.0	0.00	0.00
Time, two days.		
— 0.4	98.76	6.57
— 0.1	8.26	4.25
+ 0.1	3.14	2.61
0.5	3.04	2.32
0.8	2.10	1.93
1.2	3.04	....
3.0	2.94	....
Time, three days.		
— 0.4	100.00	7.83
— 0.1	19.97	4.25
+ 0.1	6.00	2.70
0.5	4.45	2.22
0.8	6.48	1.64
1.3	3.23	1.45
1.7	3.90	....
2.8	....	3.10

Dr. Chapin's paper, with that of Dr. W. M. Scott on the effect of pH in dyeing, which was presented at the same meeting of the A. A. T. C. C. and published in the same issue of the REPORTER, and which will be discussed more fully under dyeing, together with the papers of Speakman which were mentioned in connection with the action of the acids on wool,* easily form the most important papers that have been published to date upon the actual application of the hydrogen ion concentration factor to the wool industry.

Trotman and Trotman, "Bleacihng, Dyeing and Chemical Technology of Textile Fibers" (1925), page 201, point out that if wool remains in contact with sodium hydroxide solution of even 82° Tw. for very long it is damaged. (See work of Kertesz and Buntrock, previously discussed.) In this case the epithelial scales are dissolved, exposing the softer cortex, which is in turn attacked and the fiber completely dissolved. The rate of solution depends upon the temperature, concentration and hydrogen ion concentration of the solution. While a boiling 2 per cent solution of sodium hydroxide will dissolve wool in about five minutes, at ordinary temperatures the most destructive effect is obtained with a 32° Tw. solution (1,160 Sp. Gr., 14.2% NaOH).

According to W. F. Hoffman, *J. Biol. Chem. 65,* 251-254 (1925), when hair is heated on a steam bath for periods of an hour or more with 1 to 4% of sodium carbonate, considerable amounts of sulphur are removed. However, his examination of the filtrate for nitrogen shows comparatively little hydrolysis of the protein. When as little as 25 per cent of the total sulphur is removed in this way, it is impossible to isolate cystine from the residual hair.

Haerry, "The Processing of Wool and Wool Fabrics" (1926), page 205, mentions the use of weak solutions of sodium or potassium hydroxide in wool scouring, and says that the degreasing takes place much quicker by the employment of caustic alkali in place of the carbonate. However, as caustic alkalies exercise a corrosive action upon the wool fiber—known among wool scourers as "burning" of the wool—such a process may become very injurious to the wool if the strength of the caustic solution is not kept very low, or if the process is not timed right, or if less greasy and hence more sensitive wools are scoured together with greasy wool. "Therefore, caustic scouring baths cannot be recommended; besides, their use is not necessary, as a properly made-up soap-carbonate scouring bath, or the use of a neutral potash soap in the place of a soda soap, in combination with the right kind of scouring assistant, will always effect a complete degreasing."

Trotman, Trotman and Sutton, *J. Soc. Chem. Ind. 45,* T20-T24 (1926), in investigating the action of alkalies upon the sulphur in wool, report that when woolen fabric is soaked for twelve hours in cold normal sodium hydroxide solution, it is disintegrated and structureless.† Under the same conditions, but in a cold 0.5 normal solution, the fabric retains its cellular structure but is tendered. With 0.1 normal and 0.02 normal solutions there is tendering also, but to a less degree. Cold dilute solutions of caustic alkalies appear to attack the cortex of wool more rapidly than the epithelium, the fibers becoming quite tender before the epithelial scales are dissolved. When wool is digested with normal sodium hydroxide for some time at 60° C. (140° F.), a portion remains undissolved and requires prolonged digestion to effect solution.

A. T. King, *Dyer and Calico Printer 55,* 34-36 (1926), believes that the retention of caustic alkali by wool, from all alkaline solutions, is the root of many textile troubles, and mentions the absorption, which he believes to be entirely chemical and not physical in character, from solutions of soaps, sodium carbonate, silicate, borate and, in fact, all scouring agents which have a sodium or potassium base, due to the hydrolysis of these salts in solution.

Among the other effects of this alkali are those upon the spinning properties of the yarn; the increasing depth of yellow color of stock containing alkali on steaming or drying; increased chemical activity or susceptibility toward various reagents, which may result in uneven dyeing; weakening of the fiber; greater susceptibility to bacterial attack, etc. These effects remain after the alkali itself is removed.

King found that in a 0.01% sodium hydroxide solution (1 part in 10,000), wool picks up about 0.4% of its weight of caustic alkali at the ordinary temperature in two hours. A fifteen hours' immersion does not materially increase the absorption, which appears to be about 75% complete in ten minutes after immersion. He further states that wool absorbs 0.3% of its weight of sodium hydroxide from a 0.005% sodium hydroxide solution, and 0.05% of caustic alkali from a 0.4% soap solution.

AMMONIA ON WOOL

While it is commonly supposed and has been frequently stated in the literature that ammonia solution has very little action upon the wool fiber, some recent work by Farrer and King, *J. Textile Inst. 17,* T588-T-590 (1926), indicates that ammonia is just as active in its action upon the wool fiber, and especially in the removal of sulphur from the keratin molecule, as the other alkalies at the same hydroxyl ion concentration. The fact that for the same percentage composition the active alkalinity (pH or hydroxyl ion concentration) of ammonia solutions is so far below that of the other alkaline hydroxides may account for the popular belief that ammonia solutions have little action on wool.

Farrar and King investigated the action of ammonia solutions of various strengths at different temperatures upon a fine Botany worsted serge which had previously only been scoured and contained 3.92% of sulphur on its dry weight (100 to 105° C.). They used Carius tubes or

*Amer. Dyestuff Reporter **15,** 751-754, 764-766, 779-784 (1926); **16,** 515-520, 550-554 (1927).

†Also see Amer. Dyestuff Reporter **15,** 470-471 (1926).

soda water bottles immersed in a water bath at 70° C. (158° F.) for their experiments, and in the preliminary trials found that even dilute ammonia at 90° C. (194° F.), under pressure, more or less completely decomposes the wool with the formation of compounds such as ammonium sulphide.

On heating the wool with ammonical liquor containing 12% of NH_4OH, by weight, in the proportion of 1 part of wool to 5 parts of liquor, for 5.5 hours at 70° C. (158° F.), the sulphur content was reduced to 2.81%, the wool becoming more yellow but not appreciably tendered. In further experiments, and heating for periods of thirteen to nineteen hours, the sulphur content fell to 2.44 and 2.22%, respectively. The solutions in both cases smelt strongly of ammonium sulphide, and the wool was more tendered and harsh.

Similarly, cloth was heated for successive periods of 6.5, 6 and 6.5 hours, washing after each period and using fresh ammonia of the above strength each time. At the end of each period the sulphur content was 2.73, 2.47 and 2.10%, respectively. The cloth was left white, thin and tender, and the final liquid possessed only a very pale yellow color, having only a slight smell of ammonium sulphide.

Some further trials at lower temperatures, chiefly at 50° C. (122° F.), gave very similar results, except that less sulphur was removed for a similar length of time of heating. On heating for prolonged periods, especially when the treatments were repeated, the wool became tender. The following tables give the results of these experiments:

TABLE LXXIV

Sulphur Remaining in Wool After Ammonia Treatment at 50° C.; Origial Sulphur Content 3.92%

Time of Heating	Ammonia Strength	Sulphur Remaining in Cloth
6 hours	12% NH_4OH, by weight	3.21%
18 hours	12% NH_4OH, by weight	3.16%
40 hours	12% NH_4OH, by weight	2.64%

Wool subjected to successive treatments with ammonia for four periods of twenty-four hours each, using fresh ammonia after each treatment, gave the results shown in Table LXXV.

TABLE LXXV

Sulphur Remaining in Wool After Successive Ammonia Treatments at 50° C.

	Ammonia Strength	Sulphur Remaining in Cloth
After 1st 24 hours	12% NH_4OH, by weight	3.14%
After 2nd 24 hours	12% NH_4OH, by weight	2.48%
After 3rd 24 hours	12% NH_4OH, by weight	2.32%
After 4th 24 hours	12% NH_4OH, by weight	2.10%

In another experiment, using ammonia of the former strength, and with repeated treatments for twenty-four hours' duration, the wool was washed with dilute hydrochloric acid between each treatment and then with water. The results given in Table LXXVI indicate that the acid treatment protected the wool to some extent.

TABLE LXXVI

Sulphur Remaining in Wool After Successive Ammonia and Hydrochloric Acid Treatments

	Temp.	Ammonia Strength	Sulphur Remaining in Cloth
After 1st 24 hr.	50° C.	12% NH_4OH, by weight	3.02%
After 2nd 24 hr.	50° C.	12% NH_4OH, by weight	2.80%
After 3rd 24 hr.	50° C.	12% NH_4OH, by weight	2.58%
After 4th 24 hr.	50° C.	12% NH_4OH, by weight	2.36%

Using ammonia double the strength of that used in the last experiment, but not washing with acid between successive treatments, the results given in Table LXXVII were obtained. It was calculated that the wool lost 14% in weight during this treatment.

TABLE LXXVII

Sulphur Remaining in Wool After Successive Ammonia Treatments at 50° C.

	Ammonia Strength	Sulphur Remaining in Cloth
After 1st 24 hours	24% NH_4OH, by weight	2.96%
After 2nd 24 hours	24% NH_4OH, by weight	2.42%
After 3rd 24 hours	24% NH_4OH, by weight	2.11%
After 4th 24 hours	24% NH_4OH, by weight	2.01%

They found that alcoholic ammonia—that is, absolute alcohol saturated with dry ammonia gas—did not cause as much decomposition of the wool at low temperature as did the aqueous solutions. Treatment at 100° C. (212° F.) for 5.5 hours reduced the sulphur content only to 3.65%, the wool becoming slightly more yellow, the liquid remaining clear and colorless but smelling faintly of sulphur compounds. At higher temperatures the wool became brown and tender.

Lime on Wool

Farrar and King also point out that while Chevreul reported that the sulphur content of wool was reduced to 0.46% by steeping it in lime water, they were unable to substantiate this considerable loss of sulphur. On steeping the Botany worsted serge in saturated lime water for twenty-one days, using fresh liquor every day, and washing the wool with dilute hydrochloric acid and finally with water after each steeping, the sulphur content was as given in Table LXXVIII.

Wool "Xanthate"

Cellulose xanthate or viscose has become quite common within recent years, but a similar wool compound was reported by H. L. Mitchell, *J. Soc. Dyers and Colourists 16*, 27 (1900). He treated wool, albumen and gelatin with sodium hydroxide solution and carbon disulphide, obtaining in each case a yellowish-brown to reddish-brown

viscous solution, miscible with water and slightly miscible with organic solvents, resembling viscose in appearance. The wool compound is a dark reddish-brown color and, unlike viscose, appears to be quite stable under ordinary conditions. It is completely soluble in water, slightly soluble in alcohol, but quite insoluble in most other organic solvents. On adding hydrochloric acid to the solution, a yellow precipitate forms and hydrogen sulphide is evolved. On boiling more hydrogen, sulphide is evolved and the precipitate dissolves, leaving only a small amount of brown plastic residue. Sulphuric and nitric acids give similar precipitates which dissolve on boiling. In the case of nitric acid, a reprecipitation occurs on continued boiling, probably due to an oxidizing action.

In the same manner as lanuginic acid, "wool xanthate" gives heavy precipitates with solutions of metallic salts. Oxidizing agents, such as hydrogen peroxide, give a white precipitate, while potassium permanganate gives a heavy black precipitate containing manganese. The hydrochloric acid precipitate appears to contain about the same proportion of sulphur as the normal wool. A portion of the precipitate was dissolved in acid, neutralized as closely as possible, and examined to determine if it resembled lanuginic acid in its reactions. Unlike the latter, however, no reactions took place on the addition of picric acid, Nile Blue or any of the acid dyestuffs. A sample of lanuginic acid treated in the same manner as the wool with sodium hydroxide and carbon disulphide gave a dark brown solution which reacted in the same manner as the wool above.

M. believes that these reactions indicate the presence of one or more hydroxyl groups in the wool molecule, the product of the reaction possibly being a thiocarbonate xanthate in which the lanuginic acid takes the place of the alcohol in the ordinary compounds. An alcoholic solution of an alkaline thiocarbonate on treatment with iodine forms a compound of the constitution R.O.CO.S.S.CO.O.R. Iodine also reacts with an alcoholic solution of this "wool xanthate." From our present knowledge of the proteins and their decomposition products, it appears very probable that the compounds formed are those of the sodium salts of the amino acids, probably with the carbon disulphide in some form of combination, probably similar to Uhl's compound * of sulphur with proteins, mentioned in "Protein Compounds—III."

*See Amer. Dyestuff Reporter **15,** 608 (1926)

TABLE LXXVIII

Sulphur Content of Wool After Successive Lime Water, Hydrochloric Acid and Water Treatments

After 24 hours	3.65% of sulphur
After 48 hours	3.52% of sulphur
After 72 hours	3.42% or sulphur
After 7 days	3.32% of sulphur
After 14 days	3.32% of sulphur
After 21 days	3.32% of sulphur

Keratin Rayon

A product such as the above might be used for the manufacture of artificial silk, and British Patent No. 255,623, July 4, 1925, to Allwater and Heinemann, covers such a process. This patent covers the production of rayon by the usual spinning process from a cellulose solution prepared by dissolving a protein, such as keratin, fibrin, spongin or konchoelin, in a solution of a caustic alkali and adding successively cellulose and carbon disulphide, and a further quantity of alkali if necessary to maintain the alkali in excess. The most suitable protein is stated to be keratin from feathers, hair, horn or hoof. A satisfactory spinning solution is prepared by dissolving 100 parts of keratin in a 10% solution of sodium hydroxide, adding 10 parts of cellulose and 10 to 30 parts of carbon disulphide, sufficient alkali then being added to keep the product alkaline. The resulting fibers are claimed to be very water resistant, to dye more readily than viscose silk, and to have some of the properties of true silk.

P. O. Rowlands in British Patent No. 7740, March 30, 1912, proposes to use wool paste, as well as other nitrogenous or ammonia bearing materials, for the production of ammonia. The wool waste, shoddy, wool dust, etc., is treated with an alkaline electrolyte, preferably a 5% solution of caustic soda, heated to about 100° C. (212° F.), agitated and subjected to the action of an electric current having a current density of about 25 amperes per square foot. The ammonia is freely evolved at the cathode.

While many salts of the metals are used in mordanting wool, and in this reaction it is really the basic ion or metal which unites with the fiber, the subject of mordanting, as well as the combination of the other metals with wool, will be considered later in a separate paper.

Summary

Briefly, a review of the literature indicates that the action of the acids upon wool is largely, if not entirely, chemical, the acid uniting with the amino or other basic groups in the wool to form a true chemical compound. The principal factor in controlling the extent of this combining reaction is the hydrogen ion concentration of the solution, although time and temperature also play a large part, as well as the past history of the fiber.

In general, acid solutions are far less injurious to wool than alkaline solutions of the same comparative chemical activity, probably because the isoelectric (or neutral) point for wool is on the acid side (pH 4.8) of our theoretical neutral point (pH 7).

Theoretically there appears to be no reason why all foreign acids, either organic or inorganic, present in the wool fiber, both as free acid and in combination with the fiber, cannot be rinsed out of the fiber with water of pH 7. Experiments appear to support this theory, but the large volume of water necessary to complete the removal of

(*Continued on page* 452)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
E. H. Killheffer
Newport Chemical Works, Passaic, N. J.

Vice-Presidents
Walter S. Williams—Joseph F. X. Harold

Secretary
Walter E. Hadley
5 Mountain Avenue, Maplewood, N. J.

Treasurer
Winthrop C. Durfee
516 Atlantic Avenue, Boston, Mass.

Councilors
Ralph F. Culver — George A. Moran
B. F. Phetteplace — Hugh Christison
William R. Moorhouse — Walter M. Scott

Past President and Chairman of the Research Committee
Louis A. Olney
Lowell Textile School, Lowell, Mass.

Local Sections and Their Officers

Northern New England Section—
Harold W. Leitch, Chairman, Franklin Mills, Franklin, N. H.
A. K. Johnson, Secretary, Lowell Textile School, Lowell, Mass.

Rhode Island Section—
John Hutton, Chairman, Glenlyon Print Works, Phillipsdale, R. I.
Albro N. Dana, Secretary, Franklin Process Co., Providence, R. I.

New York Section—
Samuel L. Hayes, Chairman, Bronx Finishing Corporation, New York City
Philip H. Stott, Secretary, Newport Chemical Works, Inc., Passaic, N. J.

Philadelphia Section—
Elmer C. Bertolet, Chairman, Philadelphia Textile School, Philadelphia, Pa.
Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Piedmont Section—
H. A. Barnes, Chairman, Proximity Print Works, Greensboro, N. C
Dyer Moss, Secretary, Newport Chemical Works, Greenville, S. C

South-Central Section—
P. F. O'Neill, Chairman, Standard-Coosa-Thatcher Co., Chattanooga, Tenn.
J. Baynard Smith, Secretary, Chattanooga, Tenn.

Lowell Textile Junior Section—
John V. Killheffer, Chairman; Earl W. McLean, Secretary.

FIFTY-SECOND COUNCIL MEETING

The fifty-second meeting of the Council was held at the Engineer's Club, Boston, Mass., on Friday, June 22, 1928, W. S. Williams, Vice-President, in the chair.

The following members were in attendance: W. S. Williams, Jos. F. X. Harold, G. A. Moran, Winthrop C. Durfee, L. A. Olney, W. H. Cady, John Hutton, W. M. Scott, W. R. Moorhouse, H. Christison, R. F. Culver and W. E. Hadley.

Names of applicants admitted to Active, Junior, Associate and Corporate membership at this meeting will be published in the next issue.

The following members were transferred from Junior to Active membership: George Bostic, Jr., Woodward Allen, O. F. Graenicher, Edwin R. Donaldson and Arthur Veevers.

The names of several applicants for Active membership were considered, and the Secretary was instructed to communicate with them and suggest that they make application for Associate Membership.

In accordance with the terms of the Constitution, several members whose dues were in arrears for 1928 were recently dropped from the mailing list. By vote of the Council, those members whose dues have since been paid were reinstated.

Some time ago the Providence Section of the Association extended an invitation to hold the 1928 Annual Meeting in Providence. The Council considered this invitation and unanimously voted to accept same. The Secretary was instructed to communicate with the Local Section, informing them of the Council action.

Owing to a recent enactment of Congress, it will be necessary for our Research Assistant at Washington to be covered by indemnity insurance, and the Council voted that the Treasurer be authorized to procure a type of insurance which will fully protect the Association.

Upon recommendation of the Research Committee the Council voted that William C. Smith, our Research Assistant, at present working at the Bureau of Standards, be retained indefinitely.

A sub-committee, consisting of Mr. Christison and Mr. Williams, reported progress on the investigation concerning the correlation of the work of the Treasurer's and Secretary's offices.

W. E. Hadley, *Secretary.*

FORTY-SEVENTH RESEARCH COMMITTEE MEETING

THE Forty-seventh Research Committee Meeting of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., on Friday, June 22, 1928, L. A. Olney in the chair.

The following members were in attendance: W. S. Williams, Jos. F. X. Harold, G. A. Moran, Winthrop C. Durfee, L. A. Olney, W. H. Cady, John Hutton, W. M. Scott, W. R. Moorhouse, H. Christison, R. F. Culver, P. J. Wood, H. D. Clayton, A. E. Hirst, P. F. Ripley, K. R. Moore, R. W. Hook, and W. E. Hadley.

Letters of regret at inability to attend were received from H. A. Barnes, Edw. F. L. Lotte and Harold W. Leitch.

The chairman reported at some length in regard to the endeavors which had been made to secure bids upon the standard machine for laboratory washing tests. Plans and specifications had been submitted to concerns in Baltimore, Lowell and Lawrence, and also to the Atlas Electric Devices Company, of Chicago, manufacturers of the Fade-Ometer. The latter concern had not only submitted prices but had also built one machine and had forwarded photographic illustrations of the same.

After a discussion which went into many details in regard to the proposed machine, it was voted to consider favorably the proposal offered by the Atlas Electric Devices Company, and it was left to the chairman of the committee to complete such arrangements as might be necessary in regard to constructing a number of them, it being understood, however, that no change in price or in essential construction of the machine should be made by the Atlas Electric Devices Company without the full approval of the Research Committee.

Ralph F. Culver, who was appointed at a previous meeting to secure a proper name plate for the machine, presented several samples and it was finally voted to have placed upon the machine a plate bearing the following:

Standard Machine for Laboratory Washing Tests.
Launder-ometer

Devised by the American Association of Textile Chemists and Colorists.

Authorized Manufacturer:
Atlas Electric Devices Company

It was also voted to request the Atlas Electric Devices Company to send one of these machines immediately to Mr. Appel and Mr. Smith at the Bureau of Standards, in order that final adjustments relative to speed of rotation, etc., might be determined before any number of machines were built. An illustration and details of this washing machine will be published in the 1928 Year Book.

George A. Moran, chairman of the Sub-Committee on "Fastness Tests for Dyed or Printed Cotton," presented a tentative report on laundry tests, as embodying the use of hypochlorite solution. This report will be published in the 1928 Year Book.

A committee consisting of Dr. Hans Meyer, Dr. Jos. F. X. Harold and Wm. R. Moorhouse, appointed at a previous meeting, presented a tentative report covering "Fastness to Stoving and Crocking." This report follows in full, and the committee would be pleased to receive any criticisms, or suggestions, which any member may have to make in regard to it so that they may be considered before its publication in the 1928 Year Book.

Standard Tests for Fastness to Crocking

Submitted by Sub-Committee—Dr. H. Meyer, Chairman

It is very difficult to give an exact method for testing the fastness to crocking, as all the methods at present employed are more or less individual and subject to so many variable factors. The following method, which is official elsewhere, may be tentatively employed.

The dyeing to be tested is rubbed with an unsized white cotton cloth. The cloth is placed over the index finger and applying plenty of pressure the finger is passed ten times over a length of 4 inches on the dyed fabric. Another test should be made with a moist white cloth.

While classification may be based on these tests, standards are not to be suggested until some mechanical system of applying determinable pressure over a fixed length has been developed. It may be well also to replace the white cotton cloth with some other white fabric, wool or silk, if one of these is more representative of the prospective actual contact of undyed and dyed fabric.

Classification

I. No staining or but very slight of white cloth even when wet.

II. Substantial staining with wet cloth, no staining or but slight with dry.

III. Substantial staining even with dry cloth.

Group W IV—Fastness Tests to Stoving

Submitted by Sub-Committee—Dr. H. Meyer, Chairman

The dyed yarn is made into a braid with white wool and white silk and the braid is wet out thoroughly in

a ½% soap solution at ordinary temperature and then wrung. The braid is hung while wet within a bell jar in which an excess of sulphur is set burning. In the atmosphere of sulphur dioxide produced, the braid is left to hang for 12 hours, rinsed thoroughly with cold water, wrung and dried.

CLASSIFICATION	STANDARDS
I	
No change in shade, white wool or silk unstained or only slightly.	Two per cent Scarlet S2R conc. (C. I. 79, S. 82), 10% Glauber Salt Crystals, 10% Nitrecake, enter at 140° F., bring to boil in 20 minutes and boil 1 hour.
II	
Shade changed only slightly, white wool or silk not stained at all or only slightly.	Two per cent Chrome A4B (C. I. 431, S. 355), 10% Glauber Salt Crystals, 2% Acetic Acid, start at 85° F., bring to boil in ½ hour, boil ¾ hour, then add 3% Acetic Acid 30% and boil another ¼ hour.
III	
Shade changed considerably, white wool or silk slightly stained or not at all.	Two per cent Diamine Scarlet B (C. I. 382, S. 319), 10% Glauber Salt Crystals, start at 100° F., bring to boil in 20 minutes, and boil ¾ hour, then exhaust the bath with 2% Acetic Acid 30% and boil another ¼ hour.

Group C IV—Fastness Tests to Stoving

Submitted by Sub-Committee—Dr. H. Meyer, Chairman

The method of preparing the composite braid for test is the same as for wool.

CLASSIFICATION	STANDARDS
I	
Shade unchanged, white wool or silk not stained.	One per cent Diamine Black BH (C. I. 401, S. 333). Dyed 1 hour at boil with 10 gms. Calcined Glauber Salt Crystals per liter. After 1 hour boiling 10 gms. additional Glauber Salt Crystals are added, boiled ¼ hour longer, wrung and rinsed, then diazotized and developed with meta-toluylene-diamine. Rinse well.
II	
Shades slightly changed, white wool or silk not stained.	One per cent Columbia Black (C. I. 539, S. 436). Dyed as above but not diazotized.
III	
Shade changed considerably, white wool or silk stained.	One per cent Diamond Magenta (C. I. 677, S. 512) on Tannin-Antimony mordant. The cotton is mordanted in a liquid 1:20 with 3% Tannin, enter at 140° F. and leave for 3 hours in the bath, cooling down, then squeeze. Treat for ½ hour cold with 1½% Antimony Salt, or its equivalent, and rinse well. Dye for ½ hour cold with addition of 2% Acetic Acid and heat up to 175° F. within ½ hour and rinse.

Hugh Christison, chairman of the Sub-Committee of Fastness Tests for Dyed Wool, reported progress in regard to methods for determining fastness to crabbing, steaming and decatizing.

Dr. Walter M. Scott, chairman of the Sub-Committee on Fastness Tests for Dyed Silk, reported that the methods for silk would not be revised in the 1928 Year Book, but that as soon as the standard laboratory washing machine is available, the fastness tests will be rechecked with this instrument. Dr. Scott also presented and discussed a tentative method for determining fastness to degumming of dyed silk. This report follows in full, and the committee would be pleased to receive any criticisms or suggestions which any members may have to make in regard to it, so that they may be considered before its publication in the 1928 Year Book.

Fastness to Degumming of Dyed Silk

Method of Test

Take about a 5-inch length of dyed silk yarn, divide it in three parts and add to each part an equal amount of silk in the gum. Then weave into a braid and tie the ends securely. The braid is immersed in a half per cent soap solution (same specifications as the soap solution used for the washing test) for 2 hours at a boil. The weight of the soap solution should be at least 100 times the weight of the braid and the volume should be maintained at a constant level by replacing the water lost by evaporation from time to time. After the two-hour immersion in the soap solution the braid

is rinsed in cold water, extracted and dried in the air. The braid should be dry within a period of ten minutes after it leaves the extractor. Note alteration in color of the dyed silk and also staining of the white silk.

Classification

(a) With respect to alteration in color.

Class I. No more alteration in color than the standard.

Class II. Appreciable alteration in color but no more than the standard for this class.

Class III. Greater alteration in color than the standard for Class II.

(b) With respect to staining of white silk.

Class I. The white silk is not stained.

Class II. The white silk is slightly stained but no more than the standard for this class.

Class III. The white silk is stained more than with the standard for Class II.

Standards

Class I. Five per cent Indigo MLB4B Powder Dyeing instructions given under washing.

Class II. Five per cent Indigo MLB6B Powder Dyed similar to Indigo MLB4B.

Wm. H. Cady, chairman of the Sub-Committee on Light Fastness, stated that his committee would have a comprehensive report ready for publication in the 1928 Year Book.

WALTER E. HADLEY, *Secretary.*

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER
SAMPLE SWATCH QUARTERLY
Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.
LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor
CLAYTON HOAGLAND
Managing Editor
MYRON DREW REESER
Advertising Manager
Published biweekly by
HOWES PUBLISHING CO., INC.
90 William Street, New York City
A. P. HOWES, *President* E. S. PREDMORE, *Secretary*

July 9, 1928

DYES, THE TARIFF, AND FORESIGHT

OUR imports of dyestuffs and other synthetic organic chemicals have a significance beyond their immediate effect on the trade of domestic manufacturers. They are concrete evidence of the efficacy or inefficacy of our tariff. For that reason, if for no other, the dye industry cannot study too carefully the trend of imports from month to month. An analysis of the figures on imports of finished dyes and intermediate covering the past five years would, it is obvious, be extremely valuable when the question of tariff revision presents itself to the industry for consideration.

To compile the necessary statistics and prepare such an analysis at this time would be an act of admirable foresight. The thought leads us to ask this question: What quirk of human nature causes so many business executives to plan their next move on the basis of present conditions and give such little thought to what has *caused* those conditions? The trained economist always reverts, in his reasoning, to basic causes of business prosperity or distress (as the case may be). The tariff, for example, is most certainly one of the important basic factors affecting both the present and future health of American industry; and yet comparatively few business men ever become excited over the tariff until Congress begins to play with it. This is extremely unwise.

It will be more than unwise if many dye manufacturers ignore the tariff issue at this time in their haste to clean up their desks for vacation. For it is inevitable that revision of the tariff will be among the principal objectives of the next Congress, regardless of the political make-up of that Congress. If the revision is to be made in a direction favorable to trade and industry, two things will be sorely needed next fall: first, a spirited, well-informed public support on the tariff issue, and, secondly, a body of solid, convincing, authentic facts and figures covering the operations of the *present* tariff.

All plans for a new and better tariff must obviously be based upon what has transpired under the old regulations. It follows, therefore, that any analysis made at this time of the dye and coal-tar chemical imports would eventually become a potent argument in the hands of the American dyestuff industry in its effort to maintain adequate protection.

One fact must be kept clearly in mind: The issue of tariff revision, at least so far as the dye schedules are concerned, will involve more than merely the continuation of present rates of duty. Perhaps some of those rates may with safety be reduced. But a number of important products made by the domestic industry are not sufficiently covered by the prevailing schedules. A careful study of imports such as that suggested will clearly show this inadequacy and will help greatly to support the argument for higher rates on those products.

The figures included in the Tariff Commission's annual Dye Census will also be of value; but they should be supplemented by a more detailed and up-to-date analysis of imports. Only by taking such preparatory measures now can the dye manufacturers hope for success in their efforts next fall to swing tariff revision in the right direction.

FASTNESS RESEARCH PROGRESSES RAPIDLY

THE painstaking study of fastness upon which the Research Committee of the A. A. T. C. C. has been engaged for several years is now yielding some significant results. A Sub-Committee on Light Fastness has submitted a number of reports covering fading tests on dyed fabrics carried out under various conditions and with various objectives. These have been published in the Proceedings. Another subcommittee has formulated standard washing tests and these have been revised and checked to eliminate all possible variables. A standard washing machine for making the tests has been designed and constructed, and will be distributed by the association. Several sets of tests have been completed at the Bureau of Standards in Washington, where the association's research assistant is stationed; other tests are in the course of completion at that laboratory. Various outside laboratories, mills and individuals have co-operated in checking up some of the standard washing tests.

A spirit of scientific thoroughness and patience and a praiseworthy earnestness of purpose have marked this entire study of color fastness. While the value of the final results will undoubtedly be recognized at once by almost everybody concerned with the stand-

ardizing of fastness, only those who have intimately followed the progress of the research itself can really appreciate the amount of work that it has entailed.

Two of the latest reports on methods for testing fastness to stoving and crocking and fastness to degumming of dyed silk appear in the Proceedings in this issue. It is stated that suggestions and criticisms of these methods will be welcomed by the Research Committee before the reports are published in the next Year Book. In view of the intensive study required to formulate even these simple methods, it would seem only fair that members of the Association should at least show their interest in the project to the extent of offering suggestions, or criticism if such seems to be warranted. C. H.

DYERS SHOULD SHOP

DYERS should go shopping often. Lest this thought be misconstrued we hasten to explain that shopping for such things as dyestuffs and chemicals is not what is implied. A visit to one's city or town department store is the kind of shopping to which we allude. And it would be well if a few dye manufacturers accompanied the dyers on these little shopping trips.

Those who dye textiles and those who make dyestuffs can learn many things pertinent to their respective trades by going no further than the drygoods counters of any large department store. Endowed with eyes trained to perceive the qualities and defects in colored fabrics, both will receive a lesson in modern retailing practice that they will often recall to mind afterward in the course of their daily work. They will be struck with new ideas about dyestuffs and dyeing processes in their relation to drygoods sales. To some dyers it may come as a surprise that such a close relation actually exists between the dyehouse and the drygoods counter.

While strolling through the aisles of the department store the dyer may rub elbows with those who buy and wear the products of his toil. He will mingle with members of that vast and heterogeneous public known as the Ultimate Consumer, and we wager that he will feel somewhat like a king traveling incognito among his subjects. But aside from experiencing the pleasure of watching housewives buy the goods that his hands have helped to beautify, the dyer will, let us repeat, learn facts about textile retailing that will make him a wiser dyer.

Among the most instructive lessons will be his study of the numerous claims made by the retail store as to the wearing qualities of fabrics on sale. The dyer will find that variations in price are less striking than the differences in fastness properties claimed for the same fabric in different stores. Instances of fabrics improperly labeled with respect to washing and dry-cleaning fastness will be more apparent to the observing dyer than to the housewife at his elbow. Silk excessively weighted, or rayon masquerading under fancy trade names and rendered more attractive by extravagant fastness claims, will cause him to raise an eyebrow more than once during his day's tour of the stores.

But more aspects of retailing practice than this one of fastness claims should be observed by the dyer and his shopping companion, the dye manufacturer. As they move from one counter to another and from store to store both will gain a keener appreciation of the purely aesthetic value of color in fabrics in relation to public buying habits. The queer preferences of shoppers for one shade or design or combination over another will in itself provide a subject worthy of their study.

And when our two shoppers, the dyer and the dye maker, have threaded their way wearily along several miles of aisles, past countless counters of silks and satins and voiles and calicoes, and have observed the practice of stressing the *style* elements of these fabrics above their *wearing* qualities, above their fastness and cleanability, they will nod knowingly to each other; for they will begin to understand why some mills dye costly material with cheap colors. In too many cases, style predominates over quality.

When the dye manufacturer emerges from the last store after his day's shopping trip he will, it is to be hoped, feel that both the public and the department store owner have much to learn about buying and selling textiles; and that he himself could teach the textile mill a few things about supplying the Ultimate Consumer with serviceable goods. As a result of his observations he will probably feel that what is needed is an educational campaign to stimulate more intelligent buying and retailing of textile merchandise on the basis of *serviceability* rather than style; for he will realize that retailing on this basis would create an incentive for mills to use faster dyes in their finer grade fabrics, and that this would in turn lift *trade-mark* selling to a higher plane.

Their little shopping experience will reveal to the dyer and the dye manufacturer the vast difference between a trade-marked fabric supported merely by a fastness guarantee, and a trade-mark that really stands for fast-dyed serviceable goods in the mind of the shopper.

NEW SOFT LUSTER VISCOSE PERFECTED

After years of intensive laboratory research, the Viscose Company has developed a new rayon yarn. Heretofore it has been necessary to delusterize rayon after manufacture. In the new product, the desired degree of luster is manufactured into the yarn, the result being a product which is expected by the manufacturers to greatly broaden the field of usefulness of rayon.

Announcement of the new product, which is a 24-

filament yarn, has been made by Chester C. Bassett, Jr., assistant general sales manager of the Viscose Company. In making the announcement Mr. Bassett describes the product as having "a subdued luster similar in degree to pure silk and superior in softness to the regular rayon." The degree of luster is inherent in the yarn, Mr. Bassett says, thereby insuring permanency of the original luster, as well as originality of appearance.

This new yarn is called "Dulesco 24," a special Crown Brand product. The secret process is the property of the Viscose Company, and Dulesco 24 will be an exclusive Viscose product. The company is now ready to manufacture the new yarn in quantity.

MEDALS AWARDED AT CLEMSON FOR TEXTILE STUDY

The National Association of Cotton Manufacturers' medal, offered to the textile student of Clemson College who has the highest standing in textile work, was awarded this year to H. T. Williams, of Bowling Green, S. C. Since his graduation, Mr. Williams has been designer for the Southern Weaving Company, of Greenville.

Howard S. Neiman, president of the Textile Colorist, offered a medal to stimulate interest in the development of textile chemistry and dyeing. The award was based on scholastic standing together with extra work, with particular reference to textile chemistry. R. M. Stribling, of Rockingham, N. C., received this medal. Mr. Stribling, a member of the junior class, submitted a paper on "Rayon—a Brief Discussion of the Early History and Present Processes of Fiber Manufacture, Raw Product Sources, and Uses and Applications." He has done considerable extra work in textile chemistry and dyeing.

Since the Textile Colorist medal was awarded this year for the first time, one of the medals was offered to the architectural student who submitted the most suitable design for this medal. J. W. Cunningham, of Sumter, S. C., submitted the design which was adopted, and received this medal.

A COMMON CAUSE OF OIL SPOTS

Quite a number of plants are heating water in an open tank with exhaust steam from their steam engines.

While an oil separator is usually provided in the exhaust steamheating systems, it does not always function properly, with the result that cylinder oil is pumped into the tank and soon appears on the work as large tan or brown colored spots. These spots are removed with considerable difficulty.

To eliminate trouble of this kind, the plant owner should use a cylinder oil having a sulphonated oil base which will readily wash from any goods upon which it is deposited. The oil separator should be regularly and frequently checked up to see that it is functioning properly.—Cowles Comments.

EXTRACTORIALS

The man who is continually at odds with his fellow-workers cannot do his best; neither can the others. The official family of any plant must work together in perfect harmony in order to attain the highest productive measures. . . . Each department should do its level best to make work that will aid the next department to get off an attractive production. It never pays to "pass the buck."—*Canadian Textile Journal.*

To-day New England interests are grouped and organized to a degree hitherto undreamed of. Volunteers have flocked to our colors. There is truly a new spirit of enterprise and achievement among us. New England's pioneer instincts have been reawakened. a new community consciousness is rapidly developing. We needed no Mussolini, no Hindenberg, no Lloyd George nor Lenin. All we needed was to have called to our attention the necessity of studying fundamentally our own problems and conditions and to go to work together.—*The President of the New England Council, Addressing the National Association of Woolen and Worsted Overseers.*

Manufacturers who produce chemical substances which are the raw materials of other industries have the greatest interest in the welfare of the chemical industry in the United States. It is at the base of the industry that any attack might be expected to prove most disastrous. And it is there that the possibility of attack is greatest. . . . Discussion of the need for a central organization to represent the chemical industry should be as wide as the industry.—*Oil, Paint and Drug Reporter.*

There is no longer any doubt about the final outcome of the textile industry. Modern machinery and equipment is as necessary as buildings to house machinery, and where, from lack of financial backing to buy newer machines or short-sightedness in reading the signs, the modern equipment is not installed, there is but one result.—*Fibre and Fabric.*

The public generally, and certainly chemical manufacturers, must be impressed with the increasing volume of publicity that is being given our industry, not only in trade and professional journals, but in the public press. While results from this new prominence are intangible and impossible of measurement, yet your committee believes this wider public appreciation will prove of value when the time comes to emphasize to our national legislators the essential place of the chemical industry in the American economic and industrial scheme.—*Report of Executive Committee, Manufacturing Chemists' Association.*

The Dyer's School of Experience

[Editor's Note.—*The following narrative is one of a series being published under the general head of "The Dyer's School of Experience." Realizing that the genuine material for such a series is to be found largely among its own readers, The* Reporter *solicits contributions from that source and will pay for those accepted at regular space rates. Among the readers of this journal there should be many who have, in the course of their experience as dyers or chemists, encountered incidents which should prove most interesting and helpful to their fellows. Send all manuscripts to* American Dyestuff Reporter, *90 William Street, New York City.*]

GETTING EXPERIENCE

By One Who Did

Episode IV

ON my next venture I was first engaged as a chemist and installed in a little corner of the basement in what we will call by courtesy a laboratory. My duties were simple and routine, but I was expected also to cooperate with the general manager in his attempt to bring order out of chaos.

The general manager was an efficiency man who had been recommended by the bank that was most concerned in the success of the plant. Some efficiency men are simply meddlesome pests, but this man, although well versed in finance and entirely uninformed in textile and mechanical matters, showed a wonderful ability in getting at the bottom of any matter in a masterly way. The concern was owned by a rich, old Italian, and manned by his countrymen, who, while they were patting him on the back with one hand and shouting "Viva Italia," were busy with the other hand picking his pocket. The place was full of petty bosses who strutted about like the peacocks in the zoo, and were about as useful. As quickly as we could get efficient men these fellows were weeded out and they left vowing dire vengeance in the near future.

The work consisted of pure dye only, crepes, georgettes, Charmeuse, cotton back satins, an Aniline Black department and moire finish.

Finish was the great source of contention at all times, and, as the superintendent was also the boss finisher, naturally all finish troubles were blamed on the dyehouse. Finish on a pure dye silk piece is quite another matter from the finish on weighted goods. The finisher of pure dye is expected to get something of the hand that is looked for in weighted goods, and yet the goods must not feel as if they were loaded and must not mark off. Mark-off is a term used to describe the effect of lightly scratching the finished piece with the backs of the finger nails. No marks must show or the piece will be rejected. Just how the dyer was to blame after his work had been covered over with gelatine, gum arabic, dextrine and oil I never could understand, yet he was called up on every complaint.

A $5,000 Boil-Off

At first the superintendent said that the dyer wasn't giving the goods a proper boil-off and that the mark-off was a combination of silk gum and lime soap, so it was decided that I should make a boil-off of a lot and see what the dyer could make of them. The dyer didn't like the idea and decided to make a new boil-off himself and show the world what could be done. An ex-dyer from this same place told him of the wonderful results the largest concerns in the business were getting by the use of caustic soda. He didn't know, so he didn't tell him, that they use a very weak solution at a low temperature in the presence of a large amount of Protectol.

Our dyer consulted nobody but started the big boil-off box at a full boil with 75 pounds of solid caustic soda for 350 pounds of crepe, valued at over $5,000. The first I knew of it was when he called me to tell him how to save the goods which had already run to slime at their first contact with this strong caustic. Of course, neither I nor anyone else could save the goods, so he got his hat and coat and pay check and left before anybody had a chance to fire him.

Then I was called on to officiate as head dyer until we could get a regular man. I had plenty to contend with, for every man in the place felt it his duty to remain true to the memory of his fellow countryman who was gone. On our cotton black satins they had been using the cheapest Direct Black for grays and pearls. Everyone knows how sensitive this particular black is to heat, acids and alkalies. Yet when I substituted a really fast gray I found pieces actually spotted with what could only be bleaching lime and others with strong hydrochloric acid. It is practically impossible to detect sabotage and I fear I strained the loyalty of the general manager, but he stuck by me through it all. We did check trouble in the dyehouse by a simple device. Every workman was an Italian and all belonged to the same fraternal organization, so we discharged about half of them and replaced them with Poles. The machines alternated Italians and Poles, and each class kept a close watch on the others, and we benefited in increased production and less trouble.

Disappearing Cats

Goods from the drier were first put in bins and often showed dirt that evidently got on them after drying. There were actually hundreds of cats about the place, and, by all indications, there would soon be thousands. The head of the mechanical department—a German—cooperated with me, and no one ever noticed their thinning ranks but we had less and less trouble from dirty pieces.

Now to go back to the boil-off. I couldn't induce them

to allow me to use oil and silicate; it must be soap. We had neither water filter nor softener, so that while lime soap did not form on the goods as long as there was a great excess of soap, it did begin to form as soon as they were rinsed. I remedied this by adding phosphate and ammonia in small amount to the rinse water, and had no trouble on this account.

For a time we had a great deal of trouble with spots of tar or pitch on our whites. Every locality in the plant was searched for the source of the pitch, and every clue ran out without solving the trouble. One day—by inspiration more than anything else—I tied a muslin bag over the two water valves that fill the box and that lot was free of pitch spots. Inside the bags was a dark powder resembling cocoa, which heat would melt into pitch just like we saw on the goods. The explanation is that tar on the country roads becomes a part of the dust in the course of several years and washes into the streams. The bituminous matter is colloidal and passes through the filters, but, when boiled, it coagulates and settles on the silk. The heat of the drier melts it together and a spot of pitch is the result. While this sounds like a far-fetched explanation, we checked it up carefully and verified every detail.

Our pure-dye crepes, not washable, were dyed with the regular run of acid dyes, and we had many sent back from the examiners on account of streaks. All the dyes were of the highest degree of level dyeing colors, and the lots left the dyehouse perfect. As soon as the goods were subjected to the heat of the drier, some of the colors, especially the orange, went into solution again and crept to the edges of the folds where they dried out as streaks. As soon as we found this out we stopped using acid dyes altogether, and dyed all goods the same as the washables.

The washables were first dyed with direct cotton colors from a bath containing sulphonated oil and Glauber salt. It was necessary to sour or scroop these goods after dyeing, in order to give them the feel or "hand" the finisher demanded. As I said before, we had to use crude city water, and, although sulphonated oil does not form solid lime soaps, there seems to be a liquid, insoluble, gummy oil deposited here and there on the goods, which when acidulated, makes a nice grease spot.

The Wash Test

As no other remedy availed we simply abandoned the oil altogether, and dyed with phosphate of soda and Glauber salt. In this way we overcame all these troubles and found we were able to use many neutral dyeing wool dyes that were more brilliant and equally fast to our wash test.

The wash test was five minutes heating in a 2% Ivory soap solution at 140° F., and no color must bleed out nor the sample change shade after drying.

Navy blues were made with sulphur cyanines shaded with direct dyes, sometimes given a half per cent of chrome if they were not fast enough. Chrome is not good for silk, but this small amount never gave us any trouble. I should have said bichromate of soda, for ordinary neutral chromium salts are harmless and are often used on other classes of silk materials, but do not fasten dyeings in the way that bichromate does.

Our blacks were Direct Blacks given an aftertreatment with formaldehyde, but if we could have been paid more for dyeing them it would have been better to use some of the faster Acid Blacks.

Delicate fabrics, such as charmeuse, were dyed on large star wheels with Logwood Black. The mordant was a mixture of copperas, bluestone and fustic extract; the dye was Hematine and after soaping they gave a black we could not match with anilines.

Cotton-back satins were dyed on jiggs with union colors shaded with neutral dyeing silk colors. These are finished on the back by running them on a machine equipped with a doctor blade which scrapes and squeezes into the cotton back a paste consisting of tragacanth, raw and boiled potato starch, soluble oil and a few mysterious Italian ingredients that make the whole process a deep secret. For instance, I found that the powdered tragacanth gum we were buying was a very low grade, full of dirt and foreign matter beside being rather high in color. I obtained samples of flake tragacanth and found that half the amount of the very lowest grade was greatly superior to the powder. The Italian gentleman who had charge of this department was quite ready to commit murder and flatly refused to use the new material, which would have cost us only one-fourth as much to produce the same results.

Showerproofing Radium Cloth

I investigated the silk finishes, which are bought in barrels, ready mixed, under a variety of well-sounding names at substantial prices. The stock ingredients are gelatine, Irish Moss, potato starch, tapioca dextrine, gum arabic, dextrine, soluble oils and such well-known materials. Neither the general manager nor I could persuade the finisher to even try any of our suggestions. However, we knew the reason and I guess everybody else does.

We had some orders to make radium cloth showerproof. They didn't know how to do this and had tried paraffin wax dissolved in volatile solvents, but it made the goods feel badly, so I gave one roll a run through aluminum acetate and dried it. This wasn't quite up to specifications, so I gave it a second run through weak soap solution, and the result was excellent, both as to feel and waterproofing.

About this time the general manager found that the reason a certain machine wouldn't give good results in finishing was because the manufacturer had refused to give the superintendent a commission when we bought it. Two hours later the super's chair was vacant and the atmosphere cleared. We hired a new dyer, a young Eng-

lishman with a loud voice, and a quick temper. He would swear at his helpers, and I often wondered how he escaped being dipped head first into the nearest dye box, but he made good progress and everything seemed lovely.

I mentioned the Aniline Black department; few dyers run this to-day, but here we had full equipment for padding and dyeing Aniline Black on cotton back satins. It was run by another Italian with a secret formula, and he absolutely refused to give the manager any information as to what he was doing. I was asked to work the thing out, having had experience on oxidized black on hosiery many years ago. I had a formula I developed then in which I used vanadium salts instead of copper, and found I could oxidize quicker with less danger of tendering. After a few weeks I had the formula adjusted to half-silk and showed him the samples I had made in the laboratory. It was then arranged that I should get ready to run a roll of ten pieces the next Saturday afternoon, nobody being present but the dyer and a trusted helper, the general manager and myself. We ran the roll and it was a great success. The following Monday the Aniline Black dyer and his crew walked out on us and left the department without a man. How they ever found out that we had worked there on Saturday we never knew, but the news had traveled somehow. Now I had to carry on, for we had plenty of goods on order.

In two days most of the helpers came back asking for their jobs, but we took only half of them and hired enough Poles to make up a full crew. Now by the use of vanadium I was able to almost double the speed of the ager or oxidizer and so doubled production. The black was fuller and more brilliant, and the goods were very strong. Business in general was good and we all looked forward to making the place pay a handsome profit.

Without a day's warning the crowd we had displaced got together and financed the owner somehow and he came to the place with the ringleaders. He wrote twelve letters, made out twelve checks and fired the twelve of us without a word of explanation.

They have their own way now and I hope they are happy. The experience was good and helpful, and I feel satisfied to end my days with a good, substantial dyestuff company, and leave the field to those who enjoy that kind of thing.

The Moral

I haven't the heart to point a moral to this last episode, but the lesson to be learned from all of them is more for the owner of the mill or dyehouse than for the textile chemist or dyer. When you have a man who is loyally and earnestly working for your interest, at least try to see that he gets a square deal.

It still remains true that you soon forget the price paid for a machine and remember only the service it gives.

THE ACTION OF THE ALKALIES ON WOOL

(*Continued from page* 442)

acid from the stock renders the process impractical from an industrial standpoint.

This concludes the twelfth paper upon wool by Professor Mullin. While the action of soap on wool has been mentioned quite frequently in this particular paper, as well as in some previous papers, the next paper will consider the specific action of soap, and the alkali present in soap, or wool more in detail. As sodium silicate is frequently used in connection with soap, not so much in the wool industry as in some others, the alkalinity of these solutions will be discussed from the standpoint of the recent work upon the hydrolysis of these solutions.

EFFECT OF IRON CONTAMINATION IN BLEACH

IT is a well-known fact in the chemistry of bleaching solutions that the presence of a small amount of the heavy metal salts or oxides tends to decompose the bleach. The very highly oxidizing material, hypochlorous acid, is formed in this decomposition.

An iron contamination in the bleach solution is dangerous because its natural affinity for the fiber will cause it to adhere quite tightly to the fiber and carry with it a small quantity of bleach. The local action of the iron in decomposing the bleach in that spot or area will cause a local damage or, more plainly speaking, will put a hole in the goods.

Iron stains on the fabric or the presence of iron from any source will cause this rapid decomposition of the bleach and when this occurs in the presence of cloth, a destructive, burning oxidation occurs.

Avoid the use of iron bleach tanks, pipe lines, etc., in handling bleach, and purchase a good quality bleach free from iron. We recently discovered a steel drum in use as a bleach tank. There may be many similar cases in washrooms, the danger of which is entirely overlooked. The hypochlorite and chloride in the bleach solution will rapidly attack a steel drum and so contaminate the bleach that the latter will be extremely destructive, as described above. A stoneware crock should be used as a bleach container.—Cowles Comments.

The Riverside Silk Mills, Ltd., Galt, Ont., announce that work on the plant extension will begin at once. It is stated that this is due to a rapid increase in business, particularly in types of silk yarns which are not made elsewhere in Canada. The plant has been weaving broad silks since its establishment in 1920.

William Johnson, manager of Charles B. Johnson's Machine Works, Paterson, N. J., builders of the Johnson warp-sizing machine, sailed recently on the steamship *Olympic* for a trip to Europe in the interests of the firm's foreign business

The British Textile Institute Conference at Cologne, Germany

Scientists Combine Study and Pleasure in Instructive and Well-Attended Meeting

By Charles F. Mullin, M.Sc., F.C.S., F.A.I.C., F.T.I.
Professor of Textile Chemistry and Dyeing, Clemson College, South Carolina

(Special to "The Reporter")

THE Annual Conference of the Textile Institute of England, held this year at Cologne, Germany, May 25 to 29, was very different from the usual textile meeting in America in that it was quite a holiday for everyone. The Conference was attended by about one hundred and fifty persons, many of them women, which may well be considered remarkable in that almost everyone came from England or even farther away, in most cases especially to attend this meeting. It certainly shows a deep interest in these meetings and a staunch loyalty to the Textile Institute and its officers in England.

The meeting, I repeat, was quite a holiday, and thereby differed very materially from most of our technical meetings in America—textile, chemical and otherwise. At the usual type of American meetings we are all used to having most of the days and sometimes even some of the evenings crowded with technical papers. In fact, in some of the chemical meetings especially, there is little time for the social side of the affair. Personally I am inclined, particularly after attending this meeting, to feel that probably at times we overdo the technical side of the program in America.

Personal Contacts an Important Feature

In my own case I often get far more out of the personal contacts with those attending the meetings than out of the papers presented, which may, in many cases, be of little direct personal interest. We meet John Jones (or Sokolinski) or some other old or new friend and talk over some subject of common interest. Usually I learn a lot of interesting things and I hope the other fellow does, too. Well, that was one of the principal features of the Textile Institute Conference. While some very excellent technical papers were presented, by far the largest part of the time was given over to sightseeing trips, or the members were free to come, go, and talk as they pleased. It was quite a change and in my own case extremely welcome.

The meeting was especially interesting from the standpoint of the world renowned scientists and other textile men attending, as well as the friendly spirit and good-fellowship shown by everyone during the entire Conference. The journalists of England were particularly well represented, as the editors of most of the English textile and dyestuff trade papers were in the party.

At the present time Germany appears to have an epidemic of expositions, exhibitions, fairs, etc., and Cologne is the seat of the really excellent International Press Exhibition (Pressa). On Saturday all those attending the Conference were conducted over the beautiful grounds and buildings of this large exhibit. Later they were entertained at luncheon by the Chief Burgomaster (Mayor) as the guests of the City of Koln.

Sunday was given over to a trip up the Rhine by steamer. A really wonderful trip, on our own special boat, but the Rhine trip has been described so often that it is useless for me to attempt it again. As usual on boat trips, it afforded an excellent opportunity for further acquaintance and discussion under the most delightful conditions. Luncheon and tea were served on the boat.

Papers on Cotton and Rayon at Technical Session

On Monday morning the really technical part of the meeting started with President William Howarth in the chair. Dr. C. M. Whittaker presided during the presentation of the first paper, "Cotton Bleaching," by Prof. Dr. M. Freiberger of the Technische Hochschule, Berlin-Charlottenburg. As Dr. Freiberger was unable to be present at the meeting this paper was read by W. Kershaw of the Bleachers' Association.

During the presentation of Dr. R. O. Herzog's paper upon "The Chemistry and Physics of Artificial Silk," through the courtesy of President Howarth, I had the honor of acting as chairman of the meeting. This paper was read in abstract, with many valuable comments, by Prof. Dr. Harold Hibbert with whom most of you are already acquainted. Dr. Herzog is head of the Kaiser Wilhelm-Institut fur Faserstoffchemie in Berlin, and, together with his excellent assistants, has undoubtedly conducted more research, especially along X-ray lines, upon the structure of cellulose than any other person. More about this institute later. Dr. Hibbert contributed much to this paper from his own wide experience in the study of the cellulose molecule.

The last paper upon the program was "World Prices and Trade Barriers," by Prof. Henry Clay of Manchester University, William Frost, vice-president of the Textile Institute, acting as chairman. After some discussion of the papers the technical meeting adjourned. The Institute dinner was held at the Hotel Monopol at 7.30 p. m.

Visit Plants and Schools

On Tuesday morning the entire party started on a motor trip to M. Gladbach, Krefeld, Dusseldorf, etc. A number of plants were visited, including that of A. Monforts, W. Schlafhorst & Co., and Joh. Kleine-

wefers Sohne; as well as the textile schools at M. Gladbach and Krefeld.

The latter were of particular interest to me. As I afterwards found to be universally the case, these schools are both excellently housed and equipped. As the equipment is, of course, all European, it was not at all difficult to find many things of interest. The M. Gladbach school has quite a large dyeing and finishing department, which is maintained in most excellent condition. At Krefeld one of the most interesting points was the museum of the silk school, which contains some very old and many rare samples of fabric. This trip closed the conference, although many of those attending visited other points on the Continent before returning to England.

Today's Methods Make Yesterday's Obsolete

Avoiding the Severe Boil—Loss of Weight—Reducing Number of Runs—Hosiery Dyeing

By G. S. McCarty
American Aniline & Extract Co., Philadelphia, Pa.

THE boiling out of cotton previous to dyeing is rapidly becoming a thing of the past on all classes of cotton fabrics. The trend is distinctly towards the elimination of this preparatory process in the dyehouse. Mill men are striving for production, reduction in cost, better dyed and better looking yarn. They are getting more interested in the brightness of the color, the luster of the yarn and in preserving the original elasticity and life of the cotton. These characteristics are lost when goods are given a severe boil before dyeing with strong alkalies. When goods are given a severe boil before dyeing, during, or after the dyeing, an attempt is made to restore the natural look of the cotton by the use of various finishing materials.

To-day, many representative mills are dyeing in the various types of package machines, beam machines and vacuum raw-stock machines without any previous boil-out of the cotton.

All types of colors are dyed in raw-stock machines successfully without boiling out and without the use of glue for retarding. This is of particular advantage in the dyeing of vat colors, where the boiling out and cooling process takes so long. I have seen eight batches of Indanthrene Blue produced in a ten-hour work day from a 500-pound vacuum raw-stock machine. The speed with which this type of color can be dyed is amazing.

Elimination of Glue

In package dyeing and on beam machines the most difficult colors are dyed without any previous boil-out or *the use of glue*. The elimination of glue in the dyeing of vat colors on yarn is a big advantage in itself. The author has, time and again, taken colors that the dyer was having considerable trouble with and dyed them successfully without boiling out the cotton. Some mills are eliminating the bleach cotton on dyed yarns because by eliminating the boiling-out process they retain the natural luster of the cotton, and, along with the wetting-out and penetrating agent used, brighten the color and give something of the appearance of bleach bottom dyeing.

There are many who will contend that the boil-out is needed to clean the cotton of waxes, oils and other impurities. The amount of wax and oil in cotton seemedly does not interfere with the penetration of the dyestuff and even dyeing, if the proper method is used. The loss of weight in boiling out, which is put back into the goods after dyeing, by various processes, can generally be prevented if the goods are not boiled out. All mill men know how much they lose in the weight of the cotton during its tenure in the dyehouse.

Reducing Number of Runs

Dyers of Indigo warps are running their warps *dry* into the cold Indigo bath and getting superior results, as well as cheaper dyeing, than they could by the old method of boiling out and cooling. One large dyer of Indigo warps reduced the number of runs from six to three, eliminating the boiling out, cooling and one Indigo run. Besides this, he reduced his Indigo, caustic and hydrosulphite approximately 10%, to produce the same shade he had been previously getting. They tell me their shade runs closer to standard than they had ever been able to get it previously. That is, the same shade of Indigo was produced day in and day out, with but very little deviation. The reduction in the number of runs and elimination of boiling produced a warp that beamed better and made for better weaving. The percentage of broken warps was greatly reduced.

The hosiery dyers are largely adopting this method of dyeing for their cotton and rayon hose, although some have to boil out their artificial silk hose because of the conditioning oil in the silk. But they can eliminate the boil-out by eliminating the type of conditioning oil they are using and getting one that is soluble in hot water.

If space would permit, the author could give practical formulas, time tested in a number of mills, for all the different types of dyeing machines. The time saved would probably astound a number of dyers who have never tried this method. It generally runs from 50 to 150%.

The vast number of wetting-out and penetrating agents on the market to-day is an indication of the trend of modern dyeing. To anyone doubting the practicability of this method of dyeing, the author will furnish formulas and the names of a large number of representative mills who have been doing it for some time.

Improvement in Hydrosulphite-Formaldehyde Color Discharges

Sealed Note of Camille Favre and Adolphe Wolf, Deposited June 9, 1913. Indus. Soc. Mulhouse

(Translated by Stewart F. Carter)

WE have sought to obtain color discharges brighter than those usually produced by the hydrosulphite-formaldehyde color discharges on cotton goods dyed with substantive colors. We have found that mordanting the dyed cloth with a solution, for example, 10 grams tannin per liter, increases the brightness and depth of the color, but unfortunately the ordinary hydrosulphite white is bad.

On the other hand, when mordanting with the resorcine-formaldehyde mordant of Camille Favre, according to the modified formula, as below, the white is good and the colors brighter and more intense than with tannin.

This process is excellent for dark and medium dyeings, but for light shades the mordant gives the cotton a slight rose tint, which modifies the ground color a little.

Formaldehyde-Resorcine Mordant

5 grams Resorcine
20 c.c. Water
15 grams Formaldehyde
5 grams Hydrosulphite of soda (B.A.S.F.)

Make up to one liter and boil for five minutes.

The object of the hydrosulphite is to prevent oxidation, which would give the solution a deeper color.

The boiling is to form the condensation, in order to permit the precipitation of the mordant by a passage of one minute in one part sulphuric acid to 100 parts cold water.

We have, in the third instance, sought to improve the color discharges without dulling the white or the ground color and have obtained this result by the help of "dissolving salt" (sodium benzyl sulpanilate). This latter seems to prevent the precipitation of the tanners lakes before steaming and consequently favor the fixation.

The dyed cloth may be mordanted, for example, with "dissolving salt" at 50 grams per liter, or the salt may be added to the printing colors at the rate of 25 grams to 150 grams per liter, according to the depth and brightness required.

In printing multicolor discharges on shades dyed with dischargeable basic colors on resorcine-formaldehyde mordant and mordanted with "dissolving salt," results of great brightness and a good white are obtained.

Philippe Brandt, reporting on the above, remarks that carried out, according to the resorcine-formaldehyde mordant given, the brightness of the discharge color is increased, but the fastness to light appears to be a little decreased, as well as the stability of the white. Moreover the mordanting sensibly affects the shade of light dyeings.

Mordanting a cloth with a solution containing 5 grams of "dissolving salt" per liter and then printing tanners color discharges, a very notable increase of intensity and brightness is obtained, without the fastness of the colors or the purity of the whites being affected.

The improvement is more marked when the cloth is mordanted than when the dissolving salt is added to the printing color.

The improvement of intensity is not equal for all colors, the most marked results being in the case of the red (Rhodamine 6G and Auramine) and the violet (Rhodamine B and Methylene Blue NSS).

When cloth already mordanted with resorcine-formaldehyde is mordanted with dissolving salt, perfect whites have not, so far, been obtained.

SOLUBILIZING OF STARCH WITH ACTIVIN

(Continued from page 436)

such action than potato starch. I cannot agree with this opinion, having boiled sizes with cornstarch and Aktivin in several of the large American mills, according to the above directions, with very good results in each instance. In these experiments I have learned to appreciate the use of cornstarch, which is more suitable than the potato starch almost exclusively used in Germany, because of its cheaper price there. Potato starch becomes too thin when heated during a rather long period, and this is not the case with cornstarch. Too thin a size is not desirable, because the thread does not take up a sufficient amount, and because the fuzz does not then cling itself to the fiber.

It is observed that the warp sized with Aktivin starch solution dries more quickly in the sizing machine than when common size is used. This means an increase in production. Furthermore, the Aktivin size does not form dust. As the Aktivin starch solution is transparent (the clearest is the potato starch solution), it is especially fit for colored warps because the color is not veiled.

A marked difference between the Aktivin starch solution and the common starch paste is the following: When a common starch paste is cooling, and on standing, white, cloudy and gelatinous masses are formed, water being separated (kataphoresis). But Aktivin starch solution does not act in this way. It becomes jellylike in cooling (a proof that the starch is not converted), but a kataphoresis does not take place. Often the kataphoresis is the cause of sizing that is not uniform.

The Aktivin is decomposed when boiled with starch (this makes its action possible), but sometimes it happens that small residues remain in the finished size, which are negligible, however, except if very sensitive dyestuffs are to be added to the size. In this case the color would

suffer, but this can easily be avoided by the addition of a little antichlor to the size; the traces of Aktivin are then immediately dissolved.

HOSIERY AND SHOE COLORS NAMED

ABOUT July 15 the Textile Color Card Association of the United States, Inc., in co-operation with the National Association of Hosiery and Underwear Manufacturers, will issue the new shades for fall, 1928, to the general trade.

The committee studied with utmost care the various phases of fashion's trend in color, as it applies to fabrics for garments, as well as to the leather and to other materials for shoes. It was decided to maintain the status of quite a number of tones which for the present, at least, may be regarded as classic, and this selection will be recognized by those who follow the names of shades that are now in general favor as Gunmetal, Pearlblush, Atmosphere, Champagne, Algerian, Opera Pink, Opal Mauve, Manon, French Nude, Moonlight, Rifle, Mirage, Merida, Beechnut, Bronze Nude, Grain, Dove Gray, Tawny, Misty Morn, Rose Nude, Sandy Beige, Grege, Metallique and Tansan.

The latest colors, those that will be visualized in the forthcoming special card, are named as follows: Reveree, Rose Morn, Cuban Sand, Bronze Clair, Tea Time, Honey Beige, Beach Tan, Boulevard, Light Gunmetal, and Wrought Iron.

The card also features eight shoe and leather colors promoted by the National Boot and Shoe Manufacturers' Association, National Shoe Retailers' Association and Tanners' Council of America in co-operation with the association.

Members of the trade associations referred to, through their co-operation with the Textile Color Card Association, have been furnished with the new shades, thus enabling them to have the basic materials dyed in ample time to serve their respective trades for early fall requirements.

ANTHRENE ORANGE RC PASTE NOW AVAILABLE

The Newport Chemical Works, Inc., recently placed on the market Anthrene Orange RC Paste, which is claimed to be identical in character and properties with the product classified as Colour Index No. 1169 or Schultz No. 792. The value of this type is said to be its extreme fastness to light, in which quality, it is claimed, it surpasses the other Anthrene Oranges. It is described as having, in addition, the other fastnesses which characterize the Anthrene series. Alone it is a brilliant, pleasing, yellowish orange, but, states the announcement, because it is easily reduced and levels well it is suited for combination shades, particularly those of the tan and brown ranges. Its life and brilliance make it particularly desirable for these purposes. Described as unaffected by metals, it is well suited to machine dyeing. Though not recommended for silk, it is a beautiful color for rayon.

DYE IMPORTS FOR MAY SHOW DROP FROM APRIL

FIGURES have been issued by the Bureau of Foreign and Domestic Commerce and the United States Tariff Commission covering imports of coal tar dyes through New York and other ports for the month of May. The total importations for the month came to 382,233 pounds, with an invoice value of $295,969. Imports by ports were as follows: New York, 377,126 pounds, valued at $291,257; Boston, 4,957 pounds, valued at $4,556; Malone, N. Y., 150 pounds, valued at $156. Detailed figures follow:

Imports of Synthetic Dyes

	1928	
	Pounds	Invoice Value
January	415,156	$327,148
February	478,407	391,351
March	378,191	316,183
April	633,815	505,152
May	382,233	295,969
Total five months	2,287,802	$1,835,803

	1927	
	Pounds	Invoice Value
January	196,620	$186,387
February	312,277	262,364
March	404,714	352,414
April	402,783	323,732
May	349,476	265,752
Total five months	1,665,870	$1,390,649

Per Cent of Dyes by Country of Shipment

	May, 1928	May, 1927	Jan.-May, 1928	Jan.-May, 1927
Germany	66.0	72.0	63.36	52.50
Switzerland	19.0	13.0	24.35	28.18
France	2.0	3.0	1.86	3.46
England	2.0	4.0	2.11	5.32
Belgium	4.0	3.0	3.09	5.98
Canada	3.0	2.0	2.51	2.66
Italy	2.0	2.5	2.04	1.76
Netherlands	2.0	0.5	0.68	0.14

Leading Dyes, by Quantity, Imported During May

	Pounds
Brilliant Indigo 4B (single strength)	14,794
Anthra Yellow GC (single strength)	13,167
Algol Brown G (single strength)	12,354
Vat Red Violet RH (single strength)	11,750
Algol Scarlet Paste	11,000

Technical Notes from Foreign Sources

New Reserve Under Aniline Black Ground

Sealed Note No. 1889, *Soc. Ind. Mulhouse, deposited March* 16, 1905, *by G. Knoop; L'Ind. Chim. et Rev. Gen. des Mat. Col.* 13 (*I. C.* 29), 15, 1928.—The Aniline Black goods with discharge effects, named after Prud-homme, are generally produced by printing on the fabric, freshly grounded with Aniline Black, colors containing reducing agents or alkaline reagents.

It would seem preferable to print resists on the white goods, and to ground subsequently; then, in working in this way, one would avoid the inconvenience of premature oxidation of the black. But this procedure is not easily successful, since the resists show a tendency to run if the goods are left too long in the bath.

With the purpose of avoiding this difficulty, the author conceived the idea of using a salt of aniline itself to produce a protective covering which would to a certain extent fix the soluble or pulverulent substances which one uses to prevent the black from developing.

If one mixes sodium sulpho-ricinoleate with a solution of aniline hydrochloride, there forms a copious precipitate, opaque and of gelatinous consistency. A trial confirmed the expectations based upon this reaction. As a matter of fact, by mixing gum thickener with concentrated sulpho-ricinoleate and adding a suitable amount of oxide of zinc powder, there is obtained a perfect reserve for black, one which keeps rigorously the outlines of the design in its passage through the bath. To obtain colored reserves it is sufficient to add to the white a suitable quantity of a basic dyestuff. By the combined action of the zinc oxide, the sulpho-ricinoleate, and the ferrocyanide, the color is sufficiently fixed.

The specimens (furnished with the sealed note) were prepared as follows:

(a) Print on white goods—white, yellow, rose, green, deep blue, light blue, or violet.

(b) Steam once in a small Mather-Platt.

(c) Ground with Aniline Black (hot flue) with full bath.

(d) Steam once in a small Mather-Platt.

(e) Pass through bichromate, 5 g. per liter, plus soda.

(f) Wash

Formulae

White:

1 kilo of gum thickener.
370 g. zinc oxide powder.
500 g. sodium sulpho-ricinoleate 75%.

Yellow:

1 kilo of gum thickener.
370 g. zinc oxide powder.
500 g. sulpho-ricinoleate plus 50 g. Thioflavine T (Cassella).

Rose:

50 g. Rhodamine 6G.

Green:

50 g. Brilliant Green (Bayer).

Deep Blue:

50 g. Victoria Blue BO (B. A. S. F.).

Light Blue:

50 g. Turquoise Blue.

Violet:

50 g. Violet 170B (Poirnier).

(NOTE.—These latter single dyestuffs are to be substituted for the Thioflavine in the yellow formula, all else being the same.)

(*Report Upon the Above by Pierre Binder*).—The author in his communication points out an improvement in the process already old. The principal inconvenience in the Prud-homme method lies in the fact that the goods, once impregnated with the aniline hydrochloride, can be kept only a relatively short time. It is necessary to print the white or colored discharges as soon as possible. If that printing cannot take place within a few hours, one has the choice of only two procedures: to finish the goods in black, or to wash, if the greening has not advanced too far. From the very beginning, the advantages of preliminary printing with a discharge and subsequent grounding with Aniline Black have been foreseen. But, although it is relatively easy to obtain good results on the small scale, it is no longer so when one tries it out on the large scale. In particular, one encounters the following difficulties:

(1) *Colors.*—The colors (printing pastes) must contain considerable quantities of solid matter, acting as mechanical reserves (zinc oxide, chalk, etc.). They require, on the other hand, large quantities of chemical reserves, such as sodium acetate, potassium sulphite. etc. The thickeners, as a consequence, occupy only a minor place in the mixture for which reason the colors badly attached (adherent) easily smear up the engraving of the printing roll.

(2) *Printing in Black.*—The printing demands particular precautions. The aniline hydrochloride must be grounded on the reverse of the goods, without their being immersed in a bath (see Noelting, Lehme and Piequet, 1908, p. 143). The bath must be short, for, in spite of all precautions, the feed roll carries along a certain quantity of the reserve into the bath. This as a consequence must be frequently renewed. On the other hand, the printed resists soften in contact with the preparing bath

and become reapplied, more or less strongly, to the upper roll. After a certain time one notices the formation of crusts upon the roll, which finally reapply the design to the goods as they pass between the rolls (a misplaced duplication of the impression). It is therefore necessary to clean the upper roll frequently. Whatever the precautions taken one cannot completely avoid the running of the soluble resists upon the fiber. This running can be reduced to such a degree that the designs do not show a white "halo" around them. But small white patches can always be noticed in the acute angles of the design, and this is difficult to avoid. The method of drying has also to be considered carefully. In general, drying on the steam-heated drum is recommended. The results always vary according to the nature of the fabric. A method which works well for calico will appear only fair for a satin, a voile, or a crepe.

M. Knoop's procedure appears to be of interest, because the resistive agent which he introduces into the printing paste forms a fatty precipitate in contact with the bath. (By mixing aniline hydrochloride and sodium sulpho-ricinoleate a mixture of sulphoricinoleic acid and aniline is precipitated.) The running of the reserve, which in the common process tends to begin at the passage through the rolls, is thus blocked at the beginning. Yet we have observed a difficulty in this process. The reserves do run during the steaming which precedes the grounding of the printed goods. This is not surprising, for color pastes which contain, per kilo, 270 g. of 75% sodium sulpho-rincinoleate. We must, however, add that this running does not influence the final result to any extent. The black develops normally upon the places where spreading has taken place, so that they are entirely masked at the end of the operation.

The above are the results of our examination of the process on the small scale. It remains to be seen whether goods printed with these resists may not offset on the rolls of the Mather-Platt, which would involve more serious difficulties. We do not know whether the author has tried out his procedure on the large scale. Only a long trial would bring to light its true value. But the idea merits, in our opinion, definite attention, and we therefore (ask to) publish it with the report thereon.—(*Translated.*)

Action of Acids on Wool

S. R. Trotman, E. R. Trotman and J. Brown; J. Soc. Chem. Ind. (*Trans.* p. 45) 47, 1928.—Past studies by various authors cited have led to merely greater uncertainty as to whether the phenomena observed are to be explained by physical adsorption, or adsorption followed by chemical reaction, or by chemical reaction only. As is so often the case, these contradictory explanations are firmly upheld by the various workers. The present study is a re-examination of the whole problem, with reference to the bearing of experimental results upon all the theories advanced up to the present.

With dilute acids, an apparent difference in absorption was noted between hydrochloric and sulphuric acids (table 1), but this is more apparent than real (table 2). It also appears that with dilute acids the first action which takes place is a pure adsorption of concentrated acid upon the surface of the wool, which, from results of work with concentrated acid, suggests that this film acts as a protective coating against further and destructive action of more and dilute acids upon the wool substance.

The question of H-ion concentration is also considered. From the strictly chemical side, the reaction of semicarbazide upon the wool substance was studied. In this case results indicate that the action of sulphuric acid is really somewhat different from that of hydrochloric acid; with the latter there appears to be also (beside adsorption) actual chemical reaction with the carbonyl group in wool; and this is to be considered in connection with the fact that considerably more hydrogen sulphide is evolved in the reaction with sulphuric than is the case with hydrochloric acid.

The authors conclude that the action of acids is first purely physical, then subsequently chemical, in nature, and that the discordant results of previous work have been due to neglect of the significance of such factors as agitation, relative proportions of liquid, and wool surfaces exposed.

One point of practical importance should be emphasized, that, since the coating of concentrated sulphuric acid formed by adsorption on the surface acts as a protective coating, under ordinary conditions, against damaging action of more dilute acid, which results in physical damage to the fiber, the washing of wool which has been treated with concentrated sulphuric acid should take place at a very high speed in order to remove the acid as it assumes the lower concentration so damaging to the wool substance.

Transmission of Ultra-Violet Radiation by Various Fabrics

H. R. Hirst, P. E. King and P. N. Lambers, J. Soc. Dyers and Col., 109, 44 (1928).—This subject has been carefully investigated because of the now recognized therapeutic importance of such radiation as a component of ordinary daylight, and because of the claims advanced by some manufacturers as to the permeability to this sort of radiation, possessed by the fabrics produced by them. Four detailed tables of results obtained with different types of fabric are given. The conclusion reached is that all fabrics cut off a large amount of ultra-violet radiation, and that the degree of this absorption depends principally upon the weave and texture of the goods, and not upon the actual kind of fiber of which the goods are composed.

Present Position of the Dyeing of Artificial Silks

Dr. H. H. Hodgson, Zeitsch. fuer Farbenindustrie. 66, 20 (1928).—A review (in English) of the subject titled, valuable as a clear summary, but of very general nature.

DIRECT COLORS ON RAYON CLASSIFIED BY EXHAUSTION SPEEDS

Twelve New Colors Announced by Newport Chemical Works, Inc.

LEAFLETS describing twelve new dye products developed by Newport Chemical Works, Inc., and containing swatch bows showing the shades of these colors on various materials have been issued by the manufacturers. Accompanying these leaflets is another on which Newport direct colors are classified by their speeds of exhaustion from the dye bath. This latter information is of valuable aid in the proper selection of colors for use in combination shades on rayon.

The procedure in obtaining the information as to exhaustion speeds is as follows: The dye bath is prepared using 1% color and 10% Glauber salt. The dye bath should be equal in volume to forty times the weight of the material. It is brought to 160° F., and carefully maintained at this temperature throughout the testing. A piece of goods is entered and run for five minutes. It is then removed, and four successive pieces entered, each being dyed for five minutes at 160° F. A dyeing for comparison is also run for thirty minutes at 160° F.

Five of the new colors described in the leaflets are members of the Anthrene series. They are: Anthrene Bordeaux B Paste, Anthrene Brown RA Paste, Anthrene Orange RC Paste, Anthrene Brilliant Blue R Paste and Anthrene Yellow AG Double Paste. The Bordeaux B Paste is described as being suitable for dyeing cotton and rayon, either as a self color or in combination with other vat colors of similar properties, and as possessing very good general fastness. Anthrene Brown R. Paste is of interest for the production of brown and tan shades on cotton and rayon for draperies, upholstery, etc., and is said to have exceptional general fastness, especially to light. The Orange RC Paste, it is claimed, is characterized by somewhat superior light fastness to the Anthrene Golden Orange brands and to possess in addition all the characteristic fastness of the vat dyestuffs. Anthrene Brilliant Blue R Paste is of value for dyeing of cotton in all stages of manufacture, and is also recommended highly for dyeing of rayon.

The remaining eight colors for which leaflets have been issued are: Newport Fast Chrome Brown PG, Newport Acid Anthraquinone Blue S K Y, Newport Acid Anthraquinone Violet R, Newport Rhodamine B Extra, Newport Light Fast Wool Red BL Conc., Newport Light-Fast Yellow 5GL and Newport Diazo Fast Blue NA.

The Fast Chrome Brown PG can be applied by the afterchrome, chromate and chrome bottom methods on wool in all stages of manufacture. In every respect, it is stated, its fastness properties are excellent. Silk threads in worsted piece goods are left unstained.

The new Acid Anthraquinone Blue S K Y is also described as a color of interest for the dyeing of wool in all stages of manufacture because of its fastness to light, stoving and crocking. The Anthrene Yellow AG Double Paste produces from cold vats a bright greenish shade of yellow claimed to be of very good general fastness. It is recommended for cotton, rayon and pure silk.

The Acid Anthraquinone Violet R, it is stated in the description, is a valuable color for the dyeing of wool and may be dyed either acid or in conjunction with chrome mordants, producing a pleasing reddish shade of violet that, it is claimed, has excellent fastness to fulling and light.

AMERICAN DYE TRADE IN CHINA

FOR synthetic indigo, China is a very important market, the average annual imports amounting to about 400,000 piculs, approximately 50,000,000 pounds. Hankow and Shanghai receive the largest imports of this commodity under normal conditions, according to Commercial Attache J. Arnold. In order of importance, in quantities of imports of synthetic indigo received during the year 1926, were Hankow, Tientsin, Dairen, Tsingtao, Kiukiang, Shanghai and Changsha. The Yangtze ports received the larger proportion of China's imports.

It is estimated that from 30 to 35% of Shantung's consumption is of American make. In Chihli and Shansi Provinces, it is probable that about 35 to 40% of the consumption of synthetic indigo is American. Tientsin imports of synthetic indigo for 1927 will equal about 9,000,000 pounds.

In the Customs Returns of Trade, indigo is classed as "liquid or paste and dried." In recent years, however, "reduced indigo" or "indigo white" (20% and 50% pastes) has become important; in fact, pastes of 20, 50, 60 and some of 70% are imported.

The Japanese Sulphur Black paste dominates the Manchurian market with about 70% of the business; the Germans have about 20 per cent, and the Americans the rest. The Japanese Sulphur Black is manufactured in Japan and Dairen. Several Chinese factories in Shantung turn out a crude Sulphur Black at a very low price and command about 80% of the trade of that province. The remainder is, for the most part, in the hands of German concerns. In Chihli and Shansi Provinces, Japanese and American Sulphur Black have each from 35 to 40% of the trade, and the German product from 20 to 25%.

In Manchuria, the Germans command about 25 per cent of the aniline dye business. A similar situation obtains in Shantung Province, although some American companies did some business in this section during 1927. In the territory served by Tientsin, that is Chihli and Shansi Provinces, American sales of aniline dyes have shown considerable improvement during the year, and probably account for 10 to 15% of the total imports.

The year 1927 records no serious failures among Chinese indigo and dyestuffs dealers in North China. Prices were fairly stable. The intense competition during the past few years seriously affected a number of Chinese dealers who lost on a rapidly falling market. Owing to the generally disturbed conditions in North China and the increasing political instability, there was a tendency on the part of the more aggressive manufacturers to adopt a more conservative policy. On the whole, however, it is apparent that the American dyestuffs trade in North China shows improvement in the quantity of American manufactured commodities imported into this market during the year. Trade Commissioner A. B. Calder reporting from Shanghai states that the 1927 trade in dyestuffs was fairly well maintained, with competition keen and profits small on account of operating difficulties. Indigo of 20% basis led in sales, but owing to high transportation costs for interior deliveries a distinct trend is noticeable in the increased use of indigo of 50 to 60% paste basis. The Sulphur Black market showed little improvement, because of the periodical liquidation throughout the year of excessive stocks of European origin at low prices.

MUSIC OF COLOR SHOWN IN ORGANIC DISPLAY

AN ingenious novelty in the shape of an imitation old-fashioned, Gothic style pipe organ, featuring the importance of American dyes and calling attention to the importance of color in every-day life, is now being displayed at the Du Pont Products Exhibit at Atlantic City. In the "organ" the place of the pipes is taken by long glass tubes each filled with a different colored liquid, so that all the hues of the rainbow are displayed. The frames and the keyboard are real and the stops are in various colors. A decoration of multi-colored Pyralin pieces surrounds the keyboard. What appears to be the score sheet of the music with its writing is in fact a statement which reads in part:

COLOR—MUSIC TO THE EYES

The harmonies and symphonies of color in modern products are the melodic compositions of the dyestuffs chemist.

He is the magician whose touch on the scientific keyboard of the industrial color organ creates the nuances of visual melody.

Man makes his material life . . . his clothing, his shelter, and his conveyances. Drab and flat and soulless, indeed, would they be without those visual attunings that synchronize with man's moods, his desires and his needs.

Truly, "Of all gifts to the sight of man, Color is the most divine . . ."

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

SALES MANAGER

Sales manager wanted for Southern territory by well-known manufacturers and importers of dyestuffs, finishing materials, etc. Excellent opportunity for experienced man familiar with trade in the Carolinas, etc. Apply in strict confidence to Classified Box 463, American Dyestuff Reporter.

CASH

For a vertical set of about 32 dry cans, about 74-inch face, in good condition, and mangle to match. Also for a Proctor & Schwartz automatic loop dryer for 72-inch goods. Address Box 464, American Dyestuff Reporter.

SALESMAN WANTED

With knowledge of ducks and filter fabrics, and an elementary knowledge of chemistry; travel and office work. Must be under 30, Protestant, with high or textile school training. A good opportunity for the right man. Address Box 465, American Dyestuff Reporter.

DYESTUFF SALESMAN

Experienced dyestuff salesman, well known by entire textile, leather, paper industries, etc., in territory covered by him for many years, offers his services to first-class manufacturing concern. A-1 references given. Address Box 466, American Dyestuff Reporter.

TEXTILE CHEMIST

WANTED.—Young textile chemist for sales and demonstration work by large manufacturer near Philadelphia. Applications will only be considered if they contain full particulars about training, experience, references as to character and ability and salary requirements. Address: Classified Box 467.

SALESMAN WANTED

Dyestuff salesman wanted by old-established concern for New England territory. Only a live-wire man who is acquainted with the Rhode Island, Northern Connecticut and Southern Massachusetts territory should apply. Address Box 467, American Dyestuff Reporter.

CHEMIST WANTED

Chemist wanted; one who has had actual plant experience in the production of Azo colors. State experience and earning capacity. Address Box 468, American Dyestuff Reporter, 90 William Street, New York.